American Machinist

MAY 5, 1949

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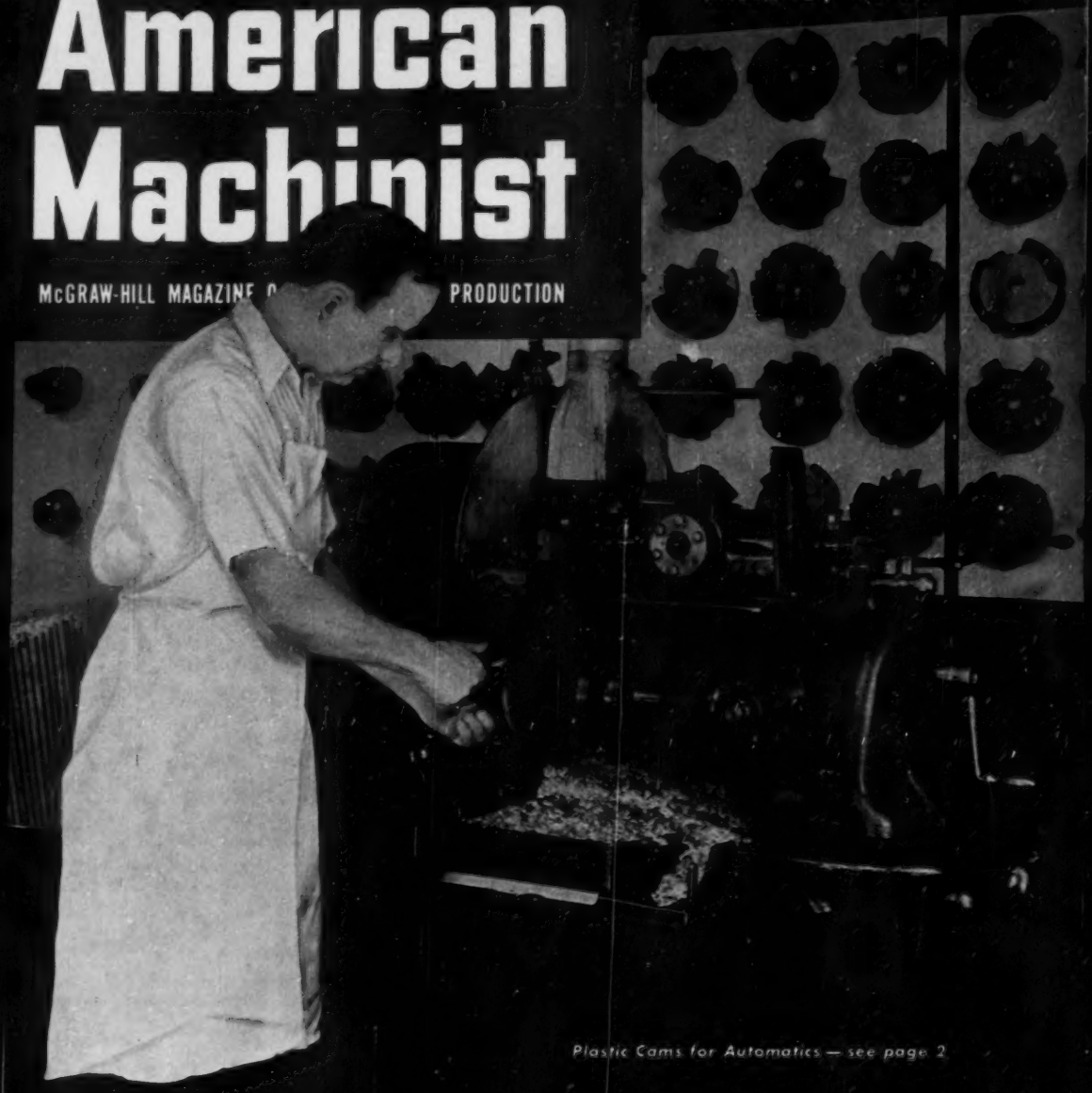

Plastic Cams for Automatics — see page 2

SOLDER EFFICIENCY

TRAIN YOUR FOREMEN IN HUMAN RELATIONS

HOW TO CHOOSE AND USE FILES

What does the **OPERATOR** really think about the **NEW HEALD MACHINES?**

This is one "opinion poll" that leaves no room for doubt. For the scores of actual field reports on new Heald machines in our files all have one thing in common — the enthusiastic endorsement of the operator.

This reaction is not accidental. All of the new Heald machines were designed with the operator's viewpoint in mind. Convenient control grouping — automatic cycles — constant feeds and speeds — improved guarding — convenient working height — easy loading and unloading — these are some of the Heald features that make the operator's job easier... and more productive, too.

Whatever your precision finishing job, there's a time-saving, effort-saving Heald machine that can help you do it faster, easier, and at lower cost. Your nearest Heald representative will be glad to study your requirements and recommend the right machine for the job. Why not get in touch with him today?

Here are a few typical answers — taken from actual field reports on Heald installations

How does the operator like the new machine? Very well.
What features appeal to him? Good working height - machine holds size very well.

How does the operator like the new machine? The operator likes the machine very much.
What features appeal to him? Efficient guarding - convenient control location

How does the operator like the new machine? The operator is very pleased with the machine.
What features appeal to him? Good guarding - easy to clean.

How does the operator like the new machine? Good.
What features appeal to him? Ease of operation - he likes the controls.

How does the operator like the new machine? He is very pleased with this equipment.
What features appeal to him? The controls - easy machine to load.

How does the operator like the new machine? Very good.
What features appeal to him? Ease of cleaning; easy access to tools.

How does the operator like the new machine? Very well, and it is not tiresome to work on
What features appeal to him? ...

HEALD

PRECISION INTERNAL AND SURFACE GRINDERS

PRECISION BORE-MATIC FINISHING MACHINES

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American Machinist

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Chips and QUIPS

Our Cover . . . A group of typical plastic cams for the automatic screw machine are shown in our cover Kodachrome. Fabric-base laminate blanks cost as much as steel ones, but can be machined with greater ease and speed. These are Formica, and are in use at the Formica plant in Cincinnati in turning plastic rod, but a number of other screw-machine shops are utilizing the process.

Files . . . We're searching constantly for fundamental—and authoritative—"how to" information. There are three, of widely varying types, in this issue, headed by our Special Report, "How to Choose and Use Files." We've been watching this one develop for months. Our usual report is a digest of data from many sources; this one is all from one: Grant Loader, plant superintendent of Heller Bros. Co., who should know. There'll be reprints available, as usual.

Quick Ideas . . . In line with our policy of giving you ideas as quickly as possible, we provide several short articles in this issue. One describes furnace-brazing of refrigerator parts at Westinghouse, another explains the special cutters for producing filleted keyways, the third suggests designs for new benches to ease workplace layouts.

Chucks . . . When Associate Editor Andy Ashburn visited Warner & Swasey a while ago, he spotted some unusual operations in making scroll chucks. His description of them appears herewith, complete with pictures. . . . This is typical of the selection job the editors must do constantly in their trips through plants. They see many modern methods and ideas; their job is to winnow out the new and broadly applicable. That means many a "dry run" plant visit and over 100,000 miles of travel each year.

Silver Throat . . . The local Western Union bobby-soxer noticed the drawing that graces the cover of our "Electroplating" Special Report in *A.M.* March 24, asking palpitatedly if it was "Bing" Crosby. We couldn't bear to confess that it was drawn from life of a plater at work at Landis Tool, Waynesboro, Pa., so with tongue in cheek we assured her it was indeed Der Bingle, replating his silver vocal cords. So romance comes again to *American Machinist*.

Humans . . . Not only is the average man a complex and competent machine, he is also a human being. Not until recent years has management realized just how important this is. The fruits of this realization have been intensive study of the human side, of employee relations. Keystone of the arch of effective management should be the foreman. So Victor I. Bumagin, of the Labor Relations Institute, explains how to train your foremen in human relations.

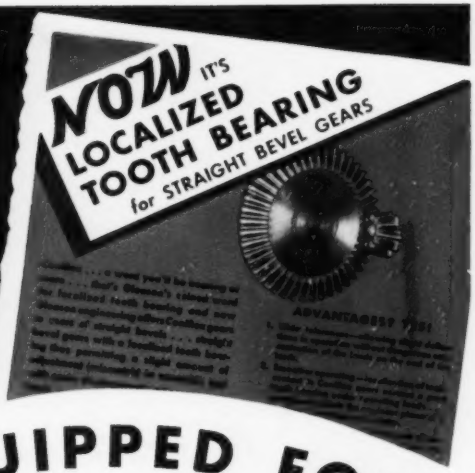
Finishing . . . After a metal product is assembled, it must be painted or otherwise finished, to protect it, to give it "eye appeal" and for other reasons. R. E. Gwyther and E. S. Stout of the Technical Service Dept., Sherwin-Williams, have set down for you the proper steps in finishing machines, using a machine tool as an example. Included are pointers on both original and maintenance finishing.

Coming . . . May 19 *A.M.* will include a number of short features and a short Special Report, the latter on sprayed metal and plastics. Among article subjects are these: induction soldering of a handle-bar assembly (5 fixtures), some quick-acting fixtures, a tricky progressive die, the safety plan at Frankford Arsenal, an automatic feed, an air press for trimming, a feeder and heater setup for cutting and forming magnet blanks, some Shop Shots from Frigidaire. There's a description of executive conferences on administration, a longer article on tests for bearing greases. Then we start a series we know you'll find very valuable, on portable tools. H. P. Bailey, president of Rotor Tool, has put down in ten concise articles a wealth of expert advice on how to choose and use portable tools, air, electric and high-cycle.

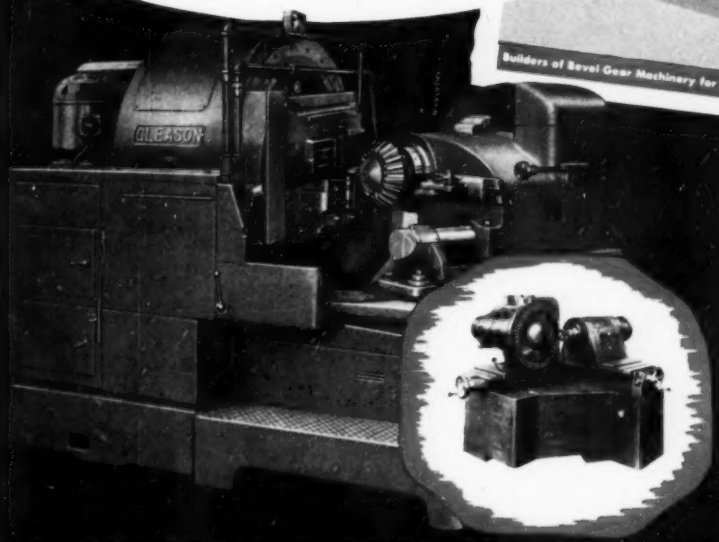
EFFICIENCY SEEKER . . . **Clifford L. Barber of Kester Solder Company has completed some extensive tests on solder efficiency. He summarizes them in this issue. Mr. Barber is an inorganic chemist, born in West Jersey, Ill., 55 years ago. After two years at Knox College, he became an aviator during the first World War, then went to Swift & Co. as an analytical chemist. In 1923, he went back to school, getting his B.S. from the University of Chicago that year, his M.S. two years later, and spending the next four years doing research in inorganic chemistry there.**

In 1929, he became director of research at Kester, which he still is. He is also an international authority on the technology of soft solders and fluxes and their production. He holds many patents on them, has written many articles about them. He is a member of the American Chemical Society, Sigma Xi, and A.S.T.M.

In August, 1946, Gleasons announced localized tooth bearing in straight bevel gears and called this new development "Coniflex."*



ARE YOU EQUIPPED FOR TODAY'S REQUIREMENTS?



Today, Coniflex gears have proven superior to ordinary straight bevels. They are easier to assemble, operate smoother, and have wider operating tolerances. Coniflex gears, as cut on the No. 24A Straight Bevel Generator, are providing outstanding operation in power shovels and cranes, road machinery, ordnance and mining equipment, steel mill table drives and other heavy equipment.

For large gears, investigate the Gleason No. 24A Straight Bevel Generator designed to cut the new Straight Bevels, Coniflex.

* Coniflex—Straight bevels with localized tooth bearing. Reg. U. S. Pat. Off.

The No. 27 Hypoid Tester, shown at left, (for testing the running qualities) and the No. 12 Generator Tool Sharpener, shown above, (to sharpen the cutting tools) complete the unit for complete production of Coniflex gears

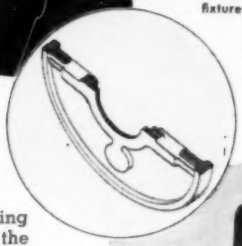
GLEASON
Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

Builders of Bevel Gear Machinery for Over Eighty Years

90 SIZES OF CAMS

. . . BROACHED ON THIS CINCINNATI EQUIPMENT

Close-up of the tooling designed by CMMCO broach engineers to broach 90 different cams. The largest and smallest parts are leaning against the fixture. One machine, a CINCINNATI No. 5-54 Vertical Single Ram Hydro-Broach, and one fixture with interchangeable details, handle all these parts.



Drawing of part broached on the equipment illustrated here. Broached surfaces are shown in color.

Part name ..... Cam
Material ..... Cast Iron
Operation .... Broach Half-Bore and Parting Face
Production ..... 140 per hour

Whenever you find similarity of machining operations in your shop, it's time to consider the cost-saving possibilities of broaching. How one manufacturer cashed in on this family trait is illustrated here. ¶The machine is a CINCINNATI No. 5-54 Vertical Single Ram Hydro-Broach, equipped by Cincinnati Application Engineers to broach *90 sizes and shapes of cams*. Size and shape of the curved section of the parts vary widely, but they are all of the same thickness and half-bore, and the parting face varies in width only. They constitute an ideal group of parts for the application of broaching to the half-bore and parting face. One fixture, with interchangeable details, accommodates the entire group of 90 cams. ¶CINCINNATI Hydro-Broach Machines broach all manner of parts, from band saw blades to automobile cylinder blocks; small lot family groups of parts to millions of identical parts. Our broach engineers are at your service. Write for methods analysis and production estimates, and include blueprints and full particulars with the letter.

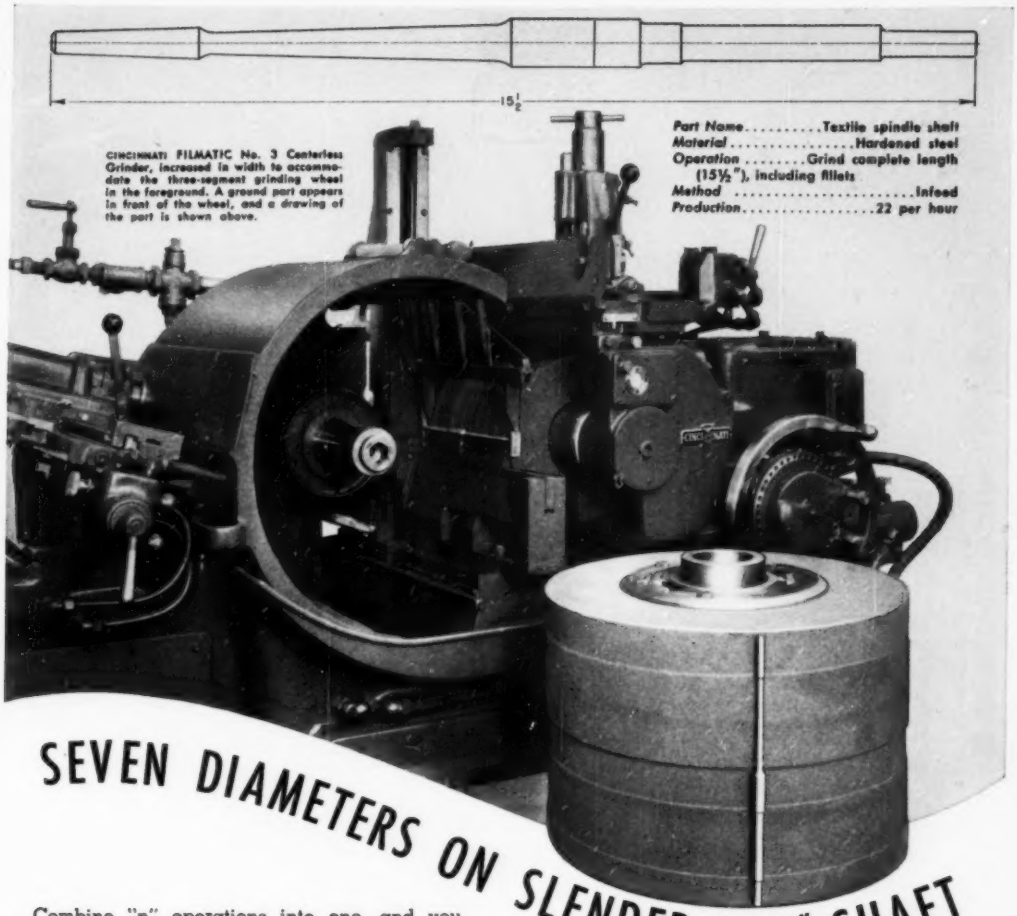
CINCINNATI No. 3-48 Vertical Single Ram Hydro-Broach Machine. Complete specifications may be obtained by writing for publication No. M-1389-2.

CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES


15½
CINCINNATI FILMATIC No. 3 Centerless Grinder, increased in width to accommodate the three-segment grinding wheel in the foreground. A ground part appears in front of the wheel, and a drawing of the part is shown above.
Part Name.....Textile spindle shaft
Material.....Hardened steel
Operation.....Grind complete length (15½"), including fillets
Method.....Infeed
Production.....22 per hour

SEVEN DIAMETERS ON SLENDER 15½" SHAFT

ground in one operation

Combine "n" operations into one, and you divide their total cost by approximately "n". This simple mathematical relationship is demonstrated by the equipment and operation shown here. The parts are textile spindle shafts. They have seven diameters, two of which are tapered. All diameters on the complete length of the shaft, including fillets, are ground in one operation on a CINCINNATI FILMATIC No. 3 Centerless Grinder. ¶ As you might suspect, Cincinnati Application Engineers had a hand in this job. The machine was widened to take care of the extra wide wheels . . profile truing units over the grinding and regulating wheels accurately true them to the required shape . . a loading attachment lowers the part to the work rest blade between the wheels. ¶ The sound design of CINCINNATI Centerless Grinders, supported by the many advantages of FILMATIC grinding wheel spindle bearings, give Cincinnati Application Engineers fine basic material with which to devise new cost saving methods in precision grinding. These men would like to show you what can be done about reducing costs in your shop. Send blueprint and complete details, or arrange to visit us in person. Meanwhile, write for a copy of catalog G-570.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CINCINNATI

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

5,000 finished pinions in 8 hours

Performance like this is typical of the Fellows Method applied to small gears and pinions. Faster output than sub-press dies. Higher accuracy, finer finish, and up to 64, 80 or even 200 pitch. That's the cost-saving story on this "small gear speedster" of the Fellows Line—the No. 3 Fine-Pitch Gear Shaper.

With magazine feed and automatic work ejection it can be set up for record production on a wide variety of small gears and pinions. Cutter speeds may be set at up to 2000 strokes per minute depending upon the work.

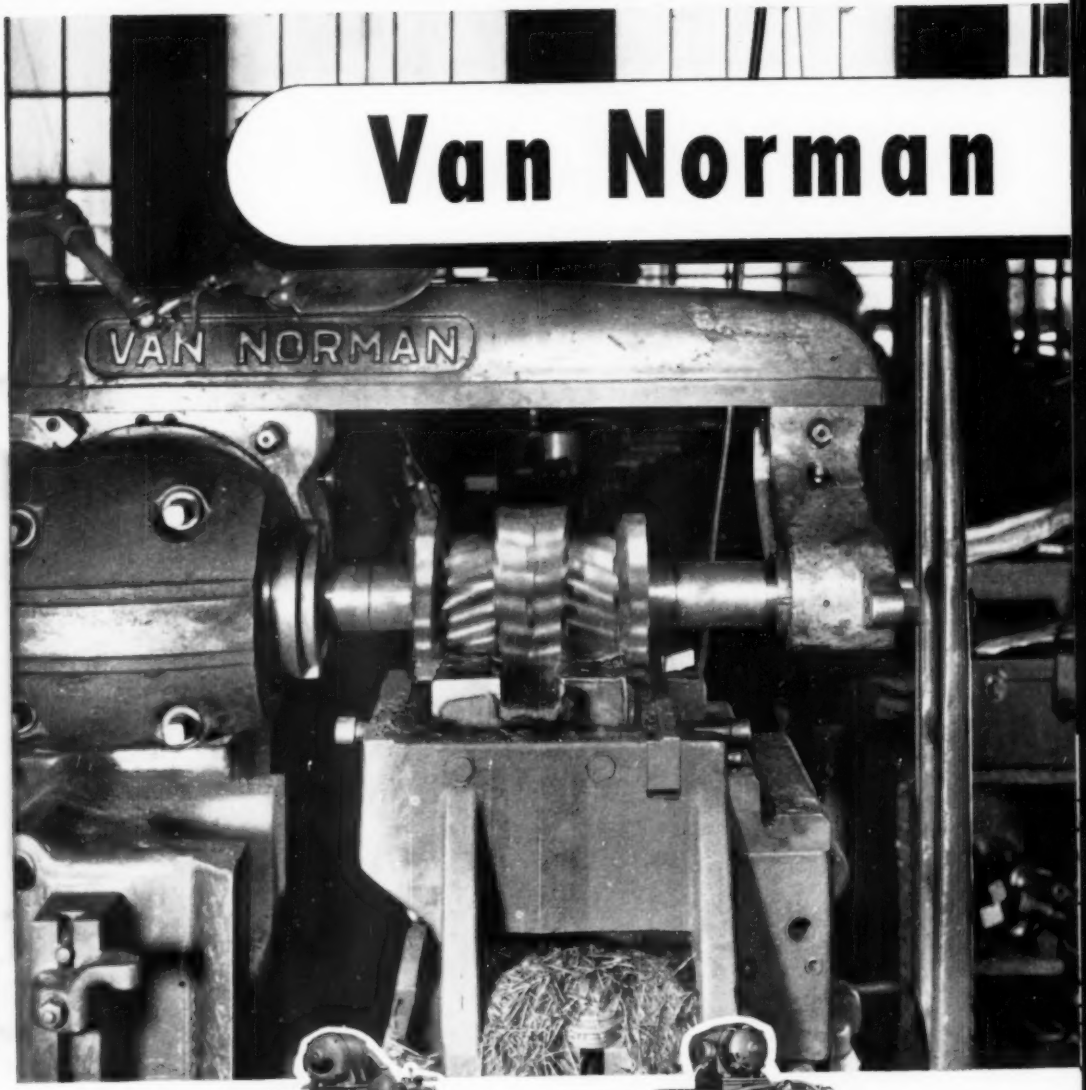
Whatever your present method of turning out small gears, the production possibilities of this Fellows machine make it worthy of investigation. An inquiry addressed to the office nearest you will bring descriptive literature, or any special data you may request.

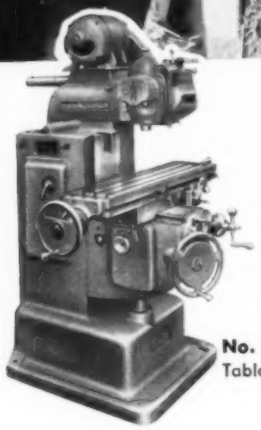
Fellows 3 in. Fine-Pitch Gear Shaper

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

Van Norman





No. 22L
Table: 45″ x 10″

No. 16
Table: 37″ x 9½″

Ram Type Millers

Increase Productivity Wherever They Are Used

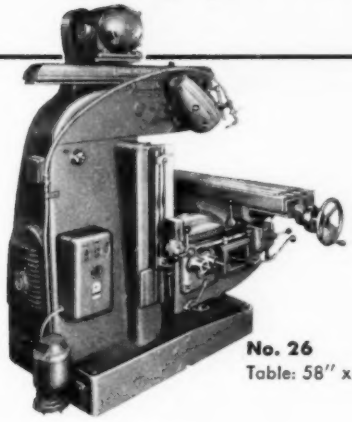
Whether it be in the toolroom, production department, machine shop or laboratory, Van Norman Ram Type Millers increase milling output and cut cost.

Here's how these versatile milling machines enable you to perform horizontal, vertical and angular milling on *one* machine. Simply position the adjustable cutterhead in the required position, lock and you are ready to proceed with the work. They minimize down time for work reset-ups because most jobs can be carried through to completion in the original set-up. In addition, the adjustable cutterhead in combination with the moveable ram and saddle cross feed increases the work range of these millers. Ease of operation is assured with the conveniently grouped operating controls, large easy-to-read dials and quick change speed and feed selectors.

Van Norman Ram Type Millers are available in a wide range of sizes with plain and universal saddles to meet practically all milling requirements. Write for information.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"



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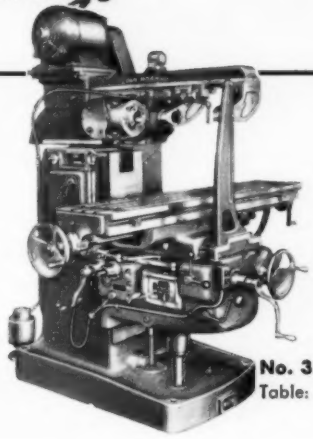

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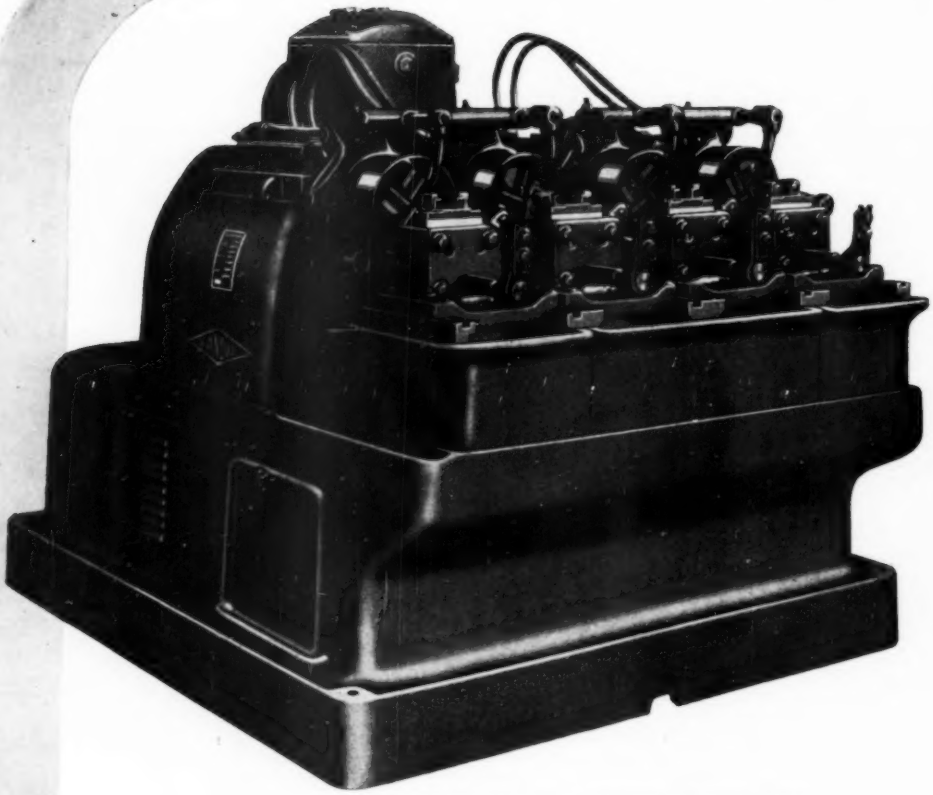
LANDIS

SEMI-AUTOMATIC



OUTSTANDING ADVANTAGES ARE:

- Low Labor Cost per piece
- Quick Set-Ups
- High Production at Low Threading Speeds
- Flexibility for all Diameters and for Special Threading Operations
- Elimination of Side Shave at Start of Thread
- Thread Concentricity

LANDIS MACHINE

4 SPINDLE

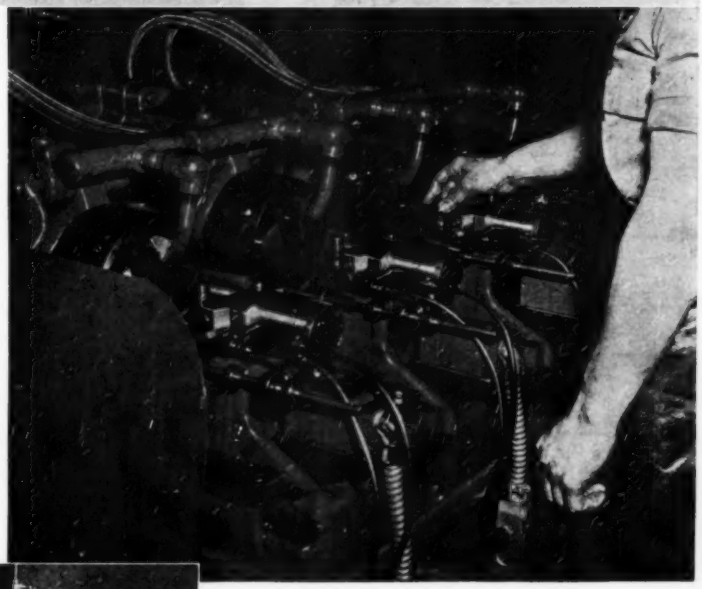
THREADING MACHINE

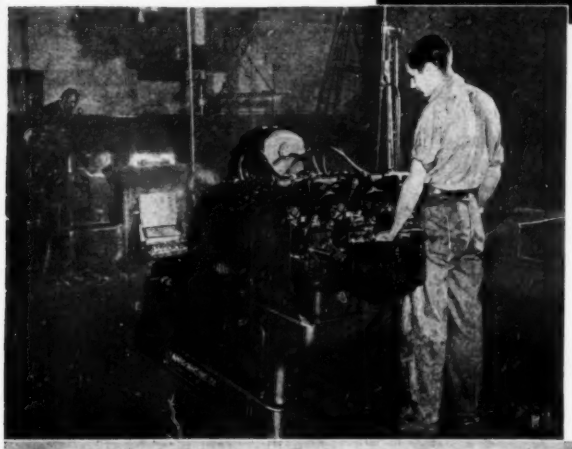
The Landis 4-Spindle Semi-Automatic Threading Machine is a precision machine designed for threading automotive parts, bolts, studs, rods, etc.

Average production ranges from 500 to 2000 pieces per hour, depending upon diameter and thread length.

The machine illustrated is cutting a 3/8" diameter 24 pitch thread 2-3/16" long on bar stock with a production of approximately 400 pieces (800 threads) per hour, reducing the threading cost 40% over previous methods.

Write for Bulletin No. 88





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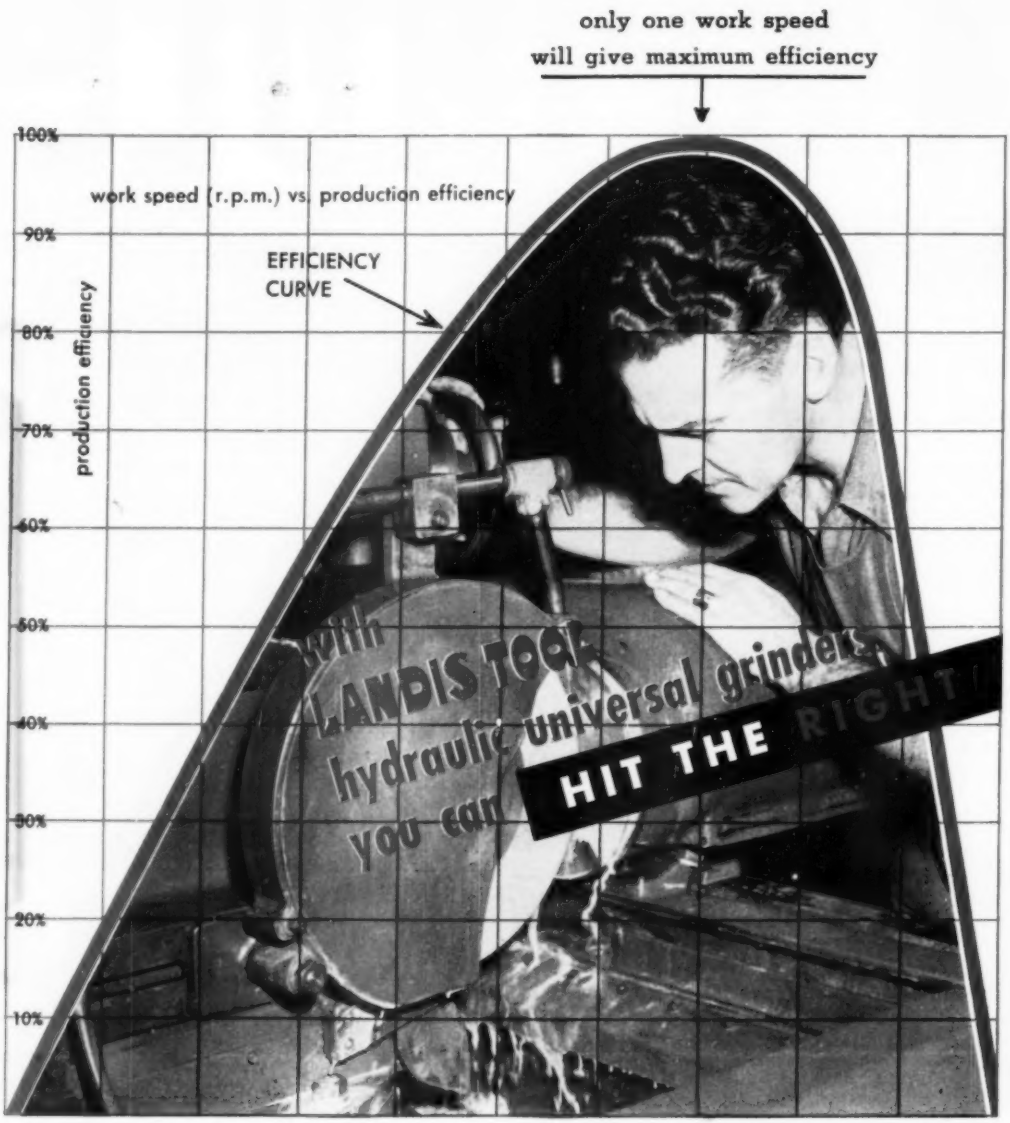


LANDIS TOOL
Precision Grinders

EQUIPPED WITH MICROSPHERE BEARINGS

No interferences from motors or belt guards when you watch grinding jobs like the one illustrated. Exclusive with LANDIS TOOL Universal Grinders.

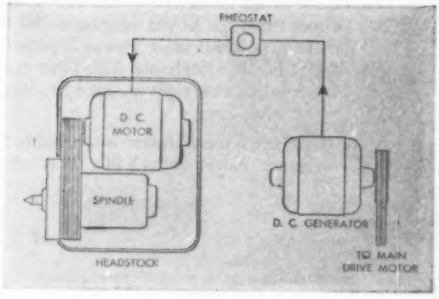
100

compact headstock

COMPACT HEADSTOCK with all Vee Belt drive. Electrical Speed Control gives infinite number of speeds without mechanical change. **There are only two revolving parts; the electric motor and the spindle.**

WORK SPEED ON EVERY JOB FOR MAXIMUM PRODUCTION

how it works



You can hit the right work speed in a hurry on every job with the LANDIS TOOL series variable voltage headstock drive—an economical, simple electrical circuit. Exclusive with LANDIS TOOL.

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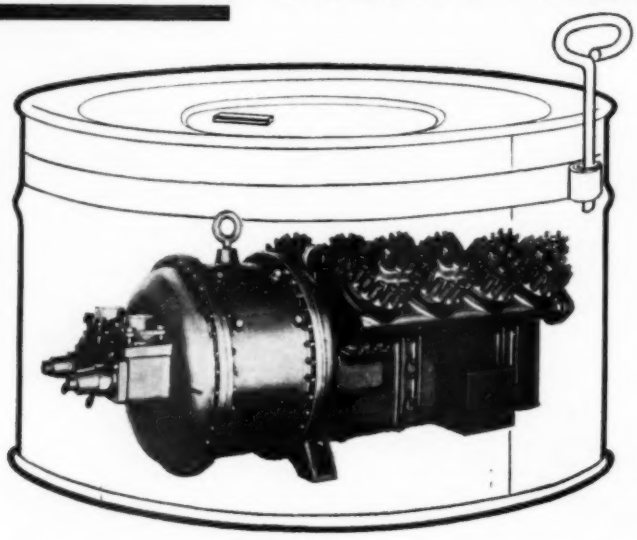
2. EYE LEVEL WHEEL FEED
3. HYDRAULIC OPERATION
4. VARIABLE SPEED HEADSTOCK
5. RAPID HYDRAULIC WHEEL POSITIONING
6. SWINGING INTERNAL FIXTURE

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

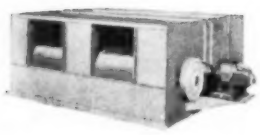
"HERMETIC" MEANS AIRTIGHT



No other air conditioning compressor can match the Westinghouse record of dependability. Because this *hermetically-sealed* compressor means no costly refrigerant leaks. It also means that system-damaging grit, moisture, rust and corrosion are *sealed out.* Westinghouse pioneered the development of the *hermetically-sealed* compressor and direct drive for power economy—no belts, no pulleys, no shaft seals. Power is provided by a sealed-in, Westinghouse Life-Line motor—famous in its own right as stronger, longer-lived and trouble-free.

These facts mean better air conditioning performance, longer over-all life, fewer breakdowns . . . lower maintenance costs. Thousands of installations, from 1 to 500 HP, have proved that the Westinghouse *hermetically-sealed* compressor gives *you* more for your air conditioning dollar. It'll pay to check with your nearest Westinghouse Air Conditioning Distributor. Or, write to the Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

Westinghouse
Sturtevant Division



AIR HANDLING UNITS

UNIT HEATERS

CENTRIFUGAL FANS

AXIAL FLOW FANS

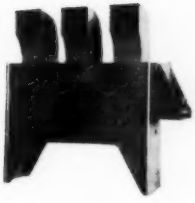
...THAT'S WHY THE WESTINGHOUSE HERMETICALLY-SEALED COMPRESSOR MEANS MORE FOR YOUR AIR CONDITIONING DOLLAR

REFRIGERATION COMPRESSORS

EVAPORATIVE CONDENSERS

HEATING AND COOLING COILS

UNIT AIR CONDITIONERS



BLOWER HEATERS

PRECIPITRON®
(Electronic Air Cleaner)

Everything that puts air to work for Every application

J-80138

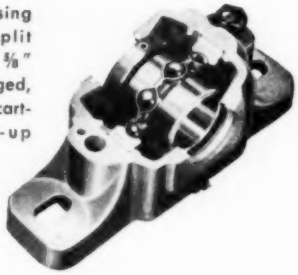
LINK-BELT offers the "QUALITY QUINTET" in BALL AND ROLLER BEARINGS

Series 200 ball bearings

Solid or split housing pillow blocks (solid shown) for shafts 5/8" to 3 15/16"—also flanged, take-up, and hanger blocks.

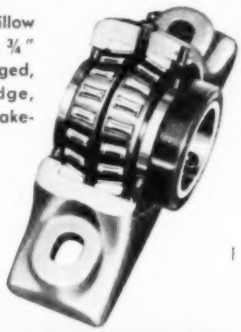
Series 300 ball bearings

Solid or split housing pillow blocks (split shown) for shafts 5/8" to 3 15/16". Also flanged, flanged cartridge, cartridge and take-up blocks.



Series 400 roller bearings

Solid housing pillow blocks for shafts 3/4" to 4"—also flanged, flanged cartridge, cartridge and take-up blocks.



Series 6800-6900 roller bearings

Split housing pillow blocks with adapter sleeves for mounting on commercial shafting of 1 7/16" to 6 15/16" diameter.

Split housing pillow blocks for press-fit on precision-turned shafting of 1.7700" to 7.4800" diameter.

Series 7800-7900 roller bearings

SEND FOR CATALOGS!

LINK-BELT COMPANY

Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Distributors in Principal Cities. 11.485

LINK-BELT BALL AND ROLLER BEARINGS

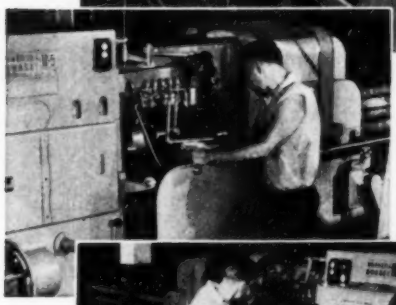
200 PIECES

20,000 PIECES

Zeros don't worry the shop with a WARNER & SWASEY CAMLESS AUTOMATIC

2,000 PIECES

200,000 PIECES



The number of pieces written in on a job ticket doesn't bother the shop which has a Warner & Swasey Camless 5-Spindle Automatic. Small-lot, medium and long-run jobs *all* can be produced *profitably* on a Warner & Swasey Camless Multiple Spindle Automatic.

"Quick-set" quadrants eliminate changing cams. Job setups are made faster, easier, simpler.

These companies have learned from experience how Camless Warner & Swasey's pay off!

200 to 500 . . . pieces per lot is common at The Alloy Steel Products Company, Linden, New Jersey; they average more than one setup each day. Even on these small-lot jobs they found it paid to take advantage of high speed, completely automatic production. Their experience shows an all-over average production increase of 50%, without need for additional floor space.

1,000 to 20,000 . . . pieces are regularly run at the Orange Roller Bearing Company, Orange, New Jersey. Lower inventories made possible by the flexibility of Camless Warner & Swasey Automatic production is a big factor in aiding them to hold advantageous price levels.

20,000 to 300,000 . . . piece lots are run at the Hopewell Division, Rockwell Manufacturing Company of Hopewell, New Jersey. Thousands of dollars are being saved in cutting-tool reconditioning and replacement. Many secondary operations have been eliminated.

To learn what a Warner & Swasey Camless Automatic, Bar or Chucker Type, may do for you, ask your nearest Warner & Swasey office, or write

It's simpler to set up a Warner & Swasey CAMLESS Automatic!

WARNER & SWASEY Machine Tools *Cleveland*

Turret Lathes, Multiple & Single Spindle Automatics, Precision Tapping and Threading Machines

Looking for Lower Cost Cylindrical Grinding?

57 ALUNDUM
abrasive with its combination of sharpness and toughness is first choice for a great majority of the cylindrical jobs on steel.

32 ALUNDUM
abrasive with its extra sharpness and coolness of cut is especially effective on many parts made of hardened steel.

ALUNDUM
abrasive (regular) has a toughness that makes it especially suitable for heavy stock removal and severe sharp corner work.

CRYSTOLON
abrasive has the combination of hardness and sharpness necessary for cast iron and the nonferrous metals.

Abrasives - Grinding Wheels - Grinding and Lapping Machines - Refractories - Porous Mediums - Non-slip Floors - Norbide Products - Labeling Machines

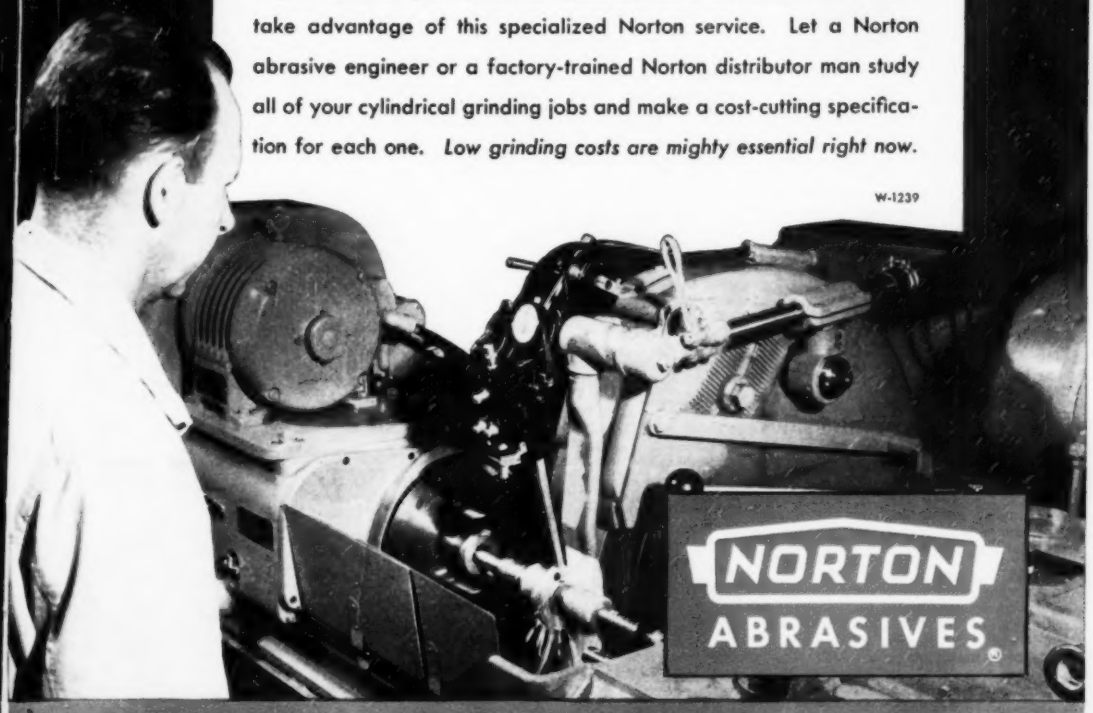
Then Put These NORTON ABRASIVES to Work on All Your Cylindrical Jobs

IF you ripsaw a board with a crosscut saw you'll get the job done but you don't expect maximum efficiency. It's just the same with your cylindrical grinding jobs. There are lots of wheels that will do each job but there's only one wheel that will do each job at the *very lowest possible grinding cost.*

That's why Norton has several different abrasives for cylindrical grinding—each with its own special characteristics, a number of bonds and a wide variety of grains, grades and structures.

If you want to get cylindrical grinding costs down to rock bottom take advantage of this specialized Norton service. Let a Norton abrasive engineer or a factory-trained Norton distributor man study all of your cylindrical grinding jobs and make a cost-cutting specification for each one. *Low grinding costs are mighty essential right now.*

W-1239

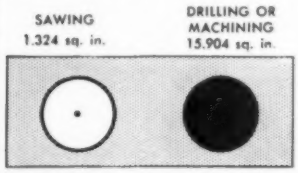


NORTON COMPANY, WORCESTER 8, MASS. • Warehouses in Five Cities • Distributors in All Principal Cities

HEAVY DUTY HOLE SAWS
for... Shop and Production Use.

A heavy duty type hole saw, which may radically change present shop practice for cutting large holes in steel or other machinable materials up to 1" thick, has been developed by the Armstrong-Blum Manufacturing Company of Chicago, who also build MARVEL Metal Sawing Machines and MARVEL High-Speed-Edge Hack Saw Blades.

These hole saws are designed for general use, not only in all types of portable power tools, but in drill presses, lathes and other standard machine tools. They reduce the cost of cutting large holes by saving setting up time, reducing machining time and lowering tooling and power costs. These economies result from the basic operating principles of a hole saw — the removal of a large core by making a narrow peripheral cut. For example, a 4½" hole with an area of approximately 16 square inches, can be sawed out with a hole saw by cutting away only 1⅓ square inches of metal.



The comparative area of metal which must be cut away to make a 4½" diameter hole

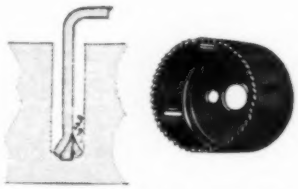
Added to the peripheral cutting principle, the "gang tool" cutting efficiency of a hole saw (a 4½" hole saw has 85 cutting teeth) *enables small capacity machine tools to cut large size holes.* A ½" portable drill can cut a 4½" hole thru ¼" steel plate in one minute. Compare this method with the ordinary practice of first, drilling a starting hole, second, setting-up a lathe or boring mill, and third, machining the hole, "a-chip-at-a-time."

BASIC DIFFERENCES IN HOLE SAWS

Hole saws are basically of two types: ordinary hole saws and MARVEL High-Speed-Edge Hole Saws. Ordinary hole saws have long been used by sheet metal workers and appliance installers for cutting holes thru sheetmetal, wallboard and other light gauge, soft material.

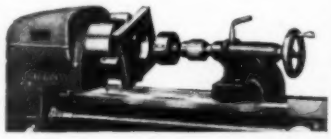
MARVEL High-Speed-Edge Hole Saws, on the other hand, were developed and designed specifically to broaden the usefulness of these tools. These uses include cutting holes in every type of machinable material to a depth of 1", as well as the usual applications. They are manufactured in sizes ranging from ⅝" to 4½" in diameter in steps of ⅛".

In order to be useful for such a wide variety of applications, a hole saw *must* have many exclusive and unique features. Due to the peripheral speed developing intense heat, a high speed steel cutting edge is essential. Furthermore, because hole saws are subjected to severe use and rough handling, the tool must be practically indestructible. MARVEL Hole Saws are made from the same materials used in the manufacture of the famous MARVEL Unbreakable High-Speed-Edge Hack Saw Blades. High speed teeth are welded to a tough, chrome vanadium body. In other words, the teeth can withstand extreme heat, will cut anything which can be cut with a high speed steel tool, yet they are unbreakable, due to the tough body which backs up the high speed steel teeth. To permit sawing deeper than the gullet of the teeth of the saw, chip clearance must be provided.

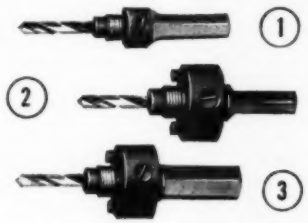


This is accomplished in MARVEL Hole Saws by a special method which produces an exclusive type of set. In every three teeth, one is set extremely to the inside, the next one straight and one slightly to the outside. The reason for the latter is to prevent binding of the saw in the cut, yet assuring fairly constant diameter during the life of the tool.

A tool which will withstand all demands imposed upon it requires an equally good arbor for the drive. MARVEL Hole Saw Arbors are all made from a solid bar of special alloy steel. One end is milled to a hexagon shank which will fit any ½", or larger, two or three jaw chuck. A special ¼" high speed steel pilot drill is furnished with each arbor. This pilot drill is held in the arbor by a set screw which contacts the drill at a 5° angle. To assure a positive lock, immune to the tendency to twist loose, the drill has a flat ground into the shank, also at a 5° angle. This method of holding the drill does not require undue stress on the jaw of the chuck to keep the pilot drill from turning in the arbor.



Only two arbors are required for the entire range of sizes, Numbers 2 and 3 being identical except for shank dimensions. These larger arbors, which are used on hole saws from 1¼" to 4½", incorporate a rugged, foolproof drive. The hole saw fits onto a ⅝" thread, but the thread does not carry the load of the drive. In the body of the arbor are two drive pins. These drive pins fit into two holes in the top



of the hole saws. In order to register the drive pins with the saw holes, it is necessary to back up the saw after it has contacted the shoulder of the arbor. When the drive pins are in place, the saw is provided with a positive, dual but flexible drive. This drive relieves the saw and pilot drill of undue strain by allowing a certain amount of "universal joint" movement. This is especially advantageous when the saw is used in portable power tools. The drive pins are not loose parts but are permanently fastened to the arbor and cannot be lost.

The No. 1 Arbors which accommodate hole saws from ⅝" to 1⅛", do not have drive pins, as on the smaller sizes this arrangement is unnecessary. The body of the smaller saws is welded to a hexagon back and removal of the hole saw is easily accomplished by clamping the hexagon shank in a vise and using a wrench on the hexagon part of the saw.

Occasionally it is difficult to use a hole saw because the body of the power tool prevents getting into close quarters or near to the work. To overcome these conditions, the No. 7 Extension is available. This handy extension is 12" long and fits over both the No. 1 and No. 2 Arbor, permitting the hole saw to be used that distance away from the power source.

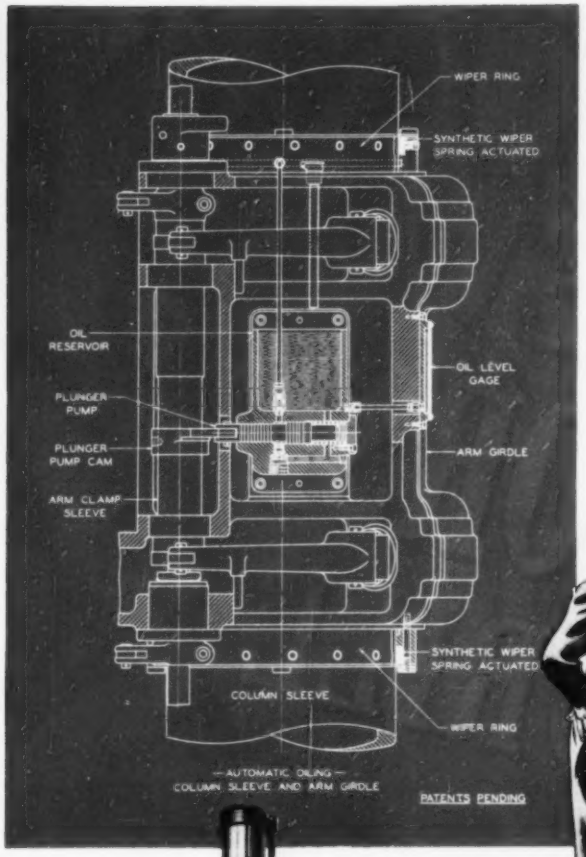
Complete instructions for proper use of MARVEL Hole Saws — correct speed, lubrication and application — are packed in each standard package of ten saws. Bulletin ST-49 contains full description, illustrations and list prices and is available for the asking. Write for your copy today to Armstrong-Blum Mfg. Co., 5700 Bloomingdale Avenue, Chicago 39, Illinois.

MARVEL Metal Cutting SAWS

Just a memory now

Column Scoring a thing of the past...

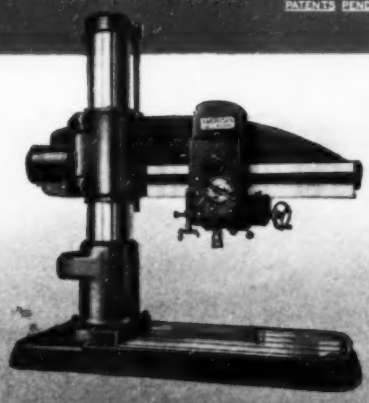
We've done something about it—



On the new "AMERICAN" Hole Wizard Radial the arm girdle and its mating column area are automatically oiled and cleansed.

Actuation of the elevating lever operates a plunger pump in the arm girdle forcing oil into the distributing reservoir at the top which lubricates the entire arm girdle area. Abrasion and oil resistant synthetic wipers at top and bottom trap the oil to prevent leakage and thoroughly cleanse the column of all dirt and foreign matter ahead of the arm girdle when raised or lowered.

This positively reduces the danger of column scoring to an absolute minimum — just another "Hole Wizard" feature that insures long life and dependable service.

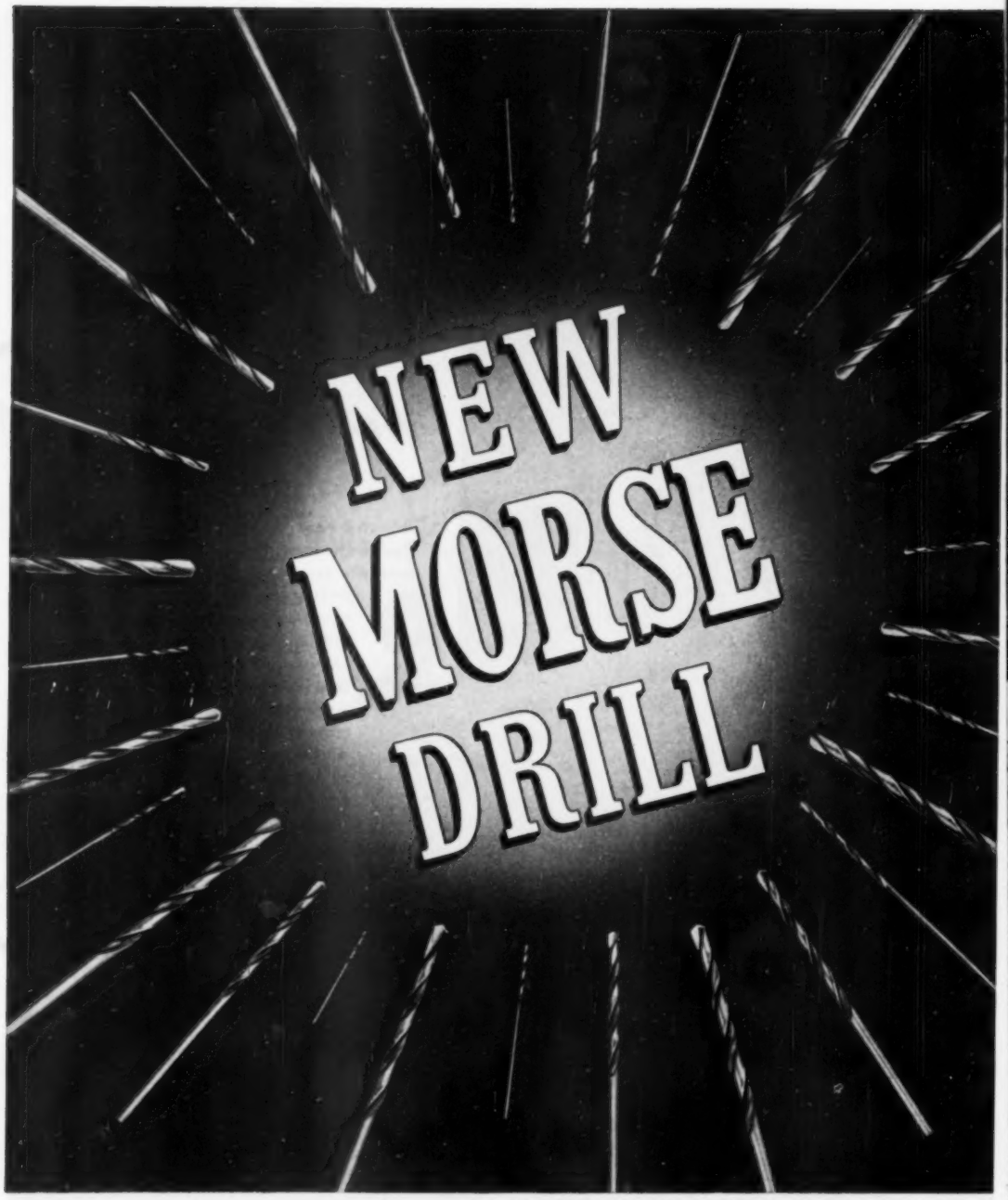


Bulletin No. 327 describes this and other exclusive "Hole Wizard" features of proven value. Want one?

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

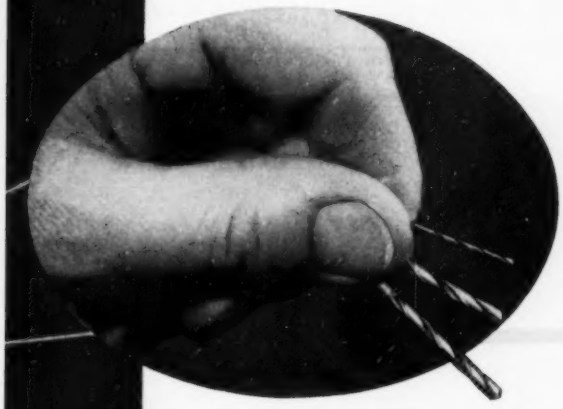


Here are the Winners
OF THE NEW-NAME CONTEST

FIRST PRIZE: R. B. Ketterer, Reading, Pa.
2nd Prize: George L. Sincell, Sewickley, Pa.
3rd Prize: Charles A. Hauck, College Point, L. I., N. Y.
4th Prize: John A. Watkins, Royal Oak, Mich.
5th Prize: Raymond W. Warman, Louisville, Ky.
6th Prize: Eugene A. Smith, Atlanta, Ga.; Guy Fifield, Rochester, N.Y.; Roy A. Freeman, South Gate, Calif.

...the "AMBORE" DRILL

that gives 50% More Production



HERE IT IS! Here's the *new* Morse Drill ... with its new thousand-dollar name ... ... the "AMBORE" ... *the drill of fewest changeovers.*

Here is the first really big news in drills since Stephen Morse produced the first twist drill. This new drill is *ground from the solid* ... with heavier web, constant angle, and wider flutes that clear chips in a faster, easier flow. And then, finally, it's processed by a *New Morse Method* that gives this drill more strength, toughness, and flexibility than any other drill now made ... to withstand the higher speeds of today's production demands.

Proved by exhaustive field tests, this new Morse Drill is available to you ... *now* ... in 59 sizes from No. 80-30 to 1/64-1/8" ... from your own Morse-Franchised Distributor. Call him *today* on *your* problem.

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Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO

"All right," *he said,* "give me one good reason why I should try this new spring steel."

so we gave him three!

"First," we told him, "this steel we've developed is lower in cost—in fact will cost you about $7.00 a ton less. Second, it has a better, smoother surface than the steel you're now using, which means that you'll lessen the danger of failure. And, third, with this steel there is less decarburization during heating and you'll get better strength in your springs."

That conversation took place less than a year ago. Since then this company, one of the largest makers of lower-priced cars in America, has used this steel for passenger car and truck springs...and has effected savings in steel cost alone that will run well in excess of $100,000 annually.

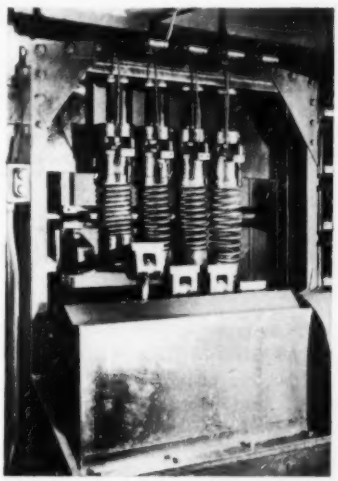
To these savings have been added others equally important. Re-treatment to meet load rates has been reduced from 40% to as low as 2%. Rejects dropped 50%, the inspection crew has been reduced by half.

That these substantial economies are obtained at no sacrifice in spring quality is shown by the fact that in fatigue tests—far more severe than those encountered under normal road conditions—absolutely no spring failures were recorded. Actual service on the road has corroborated these findings and indicates that the better surface and lower decarburization, characteristic of this steel, definitely improve spring performance.

The development of this new spring steel, now officially designated as SAE-AISI 5160, is typical of the constant striving of our metallurgical, research, and operating departments to give you, the steel user, steels *better* suited to your purpose—steels that will improve performance and lower your material and manufacturing costs.

Among such special purpose steels are heavy-duty gear steels like U·S·S Super-Kore; superior-strength plate steels like U·S·S Copper-Nickel-Molybdenum; Hadfield Manganese; and Elevated Temperature steels.

That's why we say—if your job demands the unusual in strength, abrasion resistance, durability, stamina, weldability, or forming qualities—put it up to Carilloy Research.



FATIGUE TEST—Here passenger car coil springs, produced from SAE-AISI 5160, a new precision-rolled spring steel, are being run 500 hours, sufficiently overloaded to stimulate life test on passenger car. No failure yet recorded.

CARNEGIE-ILLINOIS STEEL CORPORATION, PITTSBURGH & CHICAGO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Carilloy Steels

ELECTRIC FURNACE OR OPEN HEARTH

COMPLETE PRODUCTION FACILITIES IN CHICAGO AND PITTSBURGH

USS

9-752

UNITED STATES STEEL

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Write for New S-48 Catalog just released.

NOW! 13 REASONS

FOR USING **HARPER** EVERLASTING FASTENINGS

1 RESISTANCE TO RUST AND CORROSION
2 RESISTANCE TO HIGH TEMPERATURES
3 NON-MAGNETIC
4 NON-SPARKING
5 RE-USABLE
6 ATTRACTIVE APPEARANCE
7 EASY TO CLEAN
8 HIGH STRENGTH
9 LONG LIFE
10 LOWER ULTIMATE COST
11 RESISTANCE TO FATIGUE
12 EASY TO PLATE OR FINISH
13 RESISTANCE TO ABRASION AND WEAR

ONLY 1 REASON FOR USING COMMON STEEL-LOWER FIRST COST

An amazing combination of advantages in favor of non-ferrous and stainless steel bolt and nut products over common steel at a very small increase in cost.

6000 INDIVIDUAL ITEMS IN STOCK

The widest assortment of bolts, nuts, screws, washers, rivets and accessories in Brass, Bronzes, Copper, Monel and Stainless Steels available from one source . . . large quantities of each. Specials made to order from ample reserves of raw materials.

For Quick Response on requests for catalogs and samples write or wire direct to Inquiry Dept., The H. M. Harper Company, 8220 Lehigh Ave., Morton Grove, Illinois.

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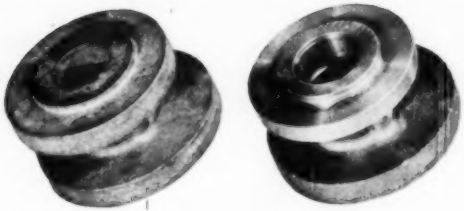
HARPER
EVERLASTING FASTENINGS

How to Cut Turning Costs With Multiple Tooling

3 Sundstrand Automatic Lathes Machine 29 Surfaces--*Saves 28.7 Minutes per Part*

Here's another good example of the savings available with multiple tooled Sundstrand Automatic Lathes. This pump part was formerly machined on three modern conventional lathes. Operations consisted of turning, facing, boring and chamfering. The total time per part with the former method was 35 minutes. In changing the job to Sundstrand Automatic Lathes with multiple tooling (as shown) the time was reduced to 6.3 minutes per part. In addition to this profitable increase, parts are consistently duplicated to close tolerances and the operator's duties simplified due to the automatic machine cycle.

If you have turning operations in your plant, investigate the savings possible with Sundstrand Automatic Lathes.



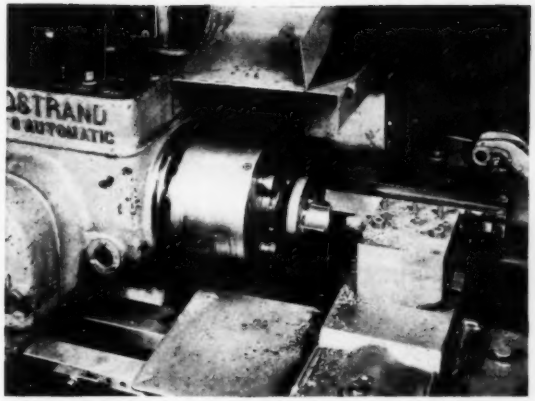
First Operation

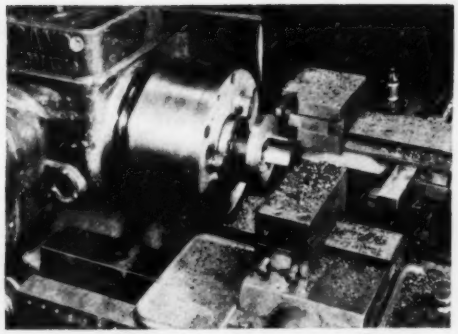
A total of 20 carbide tipped tools are used in the first set-up. Operations include: Turn, face, and chamfer the hub and mounting flange. Rough and finish bore 3 diameters and chamfer the inside diameter of the hub. Rough and finish cuts on the inside diameter are accommodated through the use of a turret type tool holder which is indexed between cuts.

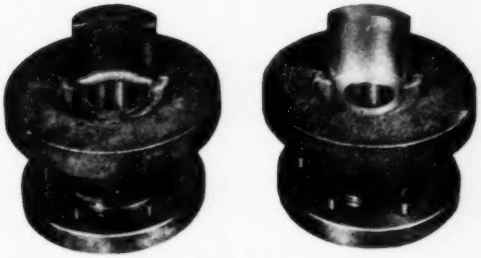
The front slide is equipped with carbide tipped tools which turn the O.D. of the mounting flange and hub. The rear slide is equipped with 3 carbide tipped tools which face the front side and chamfer the mounting flange. This Sundstrand Model 10 Automatic Lathe is equipped with an overhead slide carrying 3 carbide tipped tools which face the rear side of the mounting flange, face the hub and chamfer the O.D. of the hub. Two boring bars are carried in a manually operated turret mounted on the front slide for a rough and finish cut. Rough and finish cuts are performed on 3 diameters as well as facing the shoulders and chamfering the I.D. of the hub.

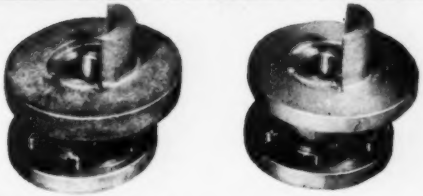
SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILL.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT









Second Operation

A Model 8 Sundstrand Automatic Lathe is used for this operation. It is equipped with 3 carbide tipped tools on the front slide. The operation includes turning the I.D. and facing the crescent, while facing the port face and chamfering the I.D. Close tolerances are maintained in spite of the intermittent cut on the crescent.

Third Operation

Another Sundstrand Model 8 Lathe is used in this operation. The front slide is equipped with 2 carbide tipped tools for turning the O.D. of the integral crescent and turning the O.D. of the flange. The rear slide carries 4 carbide tipped tools for facing both sides and chamfering the flange.

How to Cut Turning Costs FREE!

This free 44-page booklet contains helpful tips on processing turning jobs, together with illustrations and tooling diagrams. Complete engineering and production data are given on many jobs similar to yours. Write for your free copy today. Ask for bulletin 183.

Save Time On Both Long Run and Short Run Turning Jobs

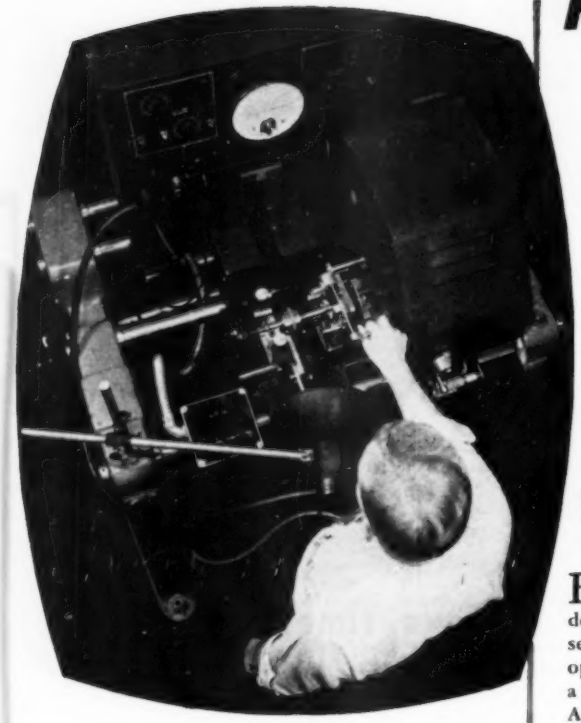
Simplicity of set-up and quick changeover make it possible to turn both long and short run work profitably on Sundstrand Automatic Lathes. It will pay you to investigate these features. Have Sundstrand engineers assist you with tooling recommendations. There is no obligation for this service.

SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

1 MACHINE handles all 3 STEPS

of the complete balancing process!



1 Locates and measures the unbalance

2 Corrects the unbalance

3 Inspects for over-all accuracy

at the rate of 100 PIECES PER HOUR!

Balancing these fans for vacuum sweepers is now done completely on *one* machine. It takes only a few seconds to locate and measure the unbalance. Then, the operator turns the piece to the proper angle and turns a hand-wheel to correspond with the meter reading. At the press of a button, a fly-cutter removes the exact amount of metal to bring the part into balance. The part may be rechecked if desired.

The inclusion of correction equipment indicates the modern trend in balancing with Gisholt DYNETRIC Balancers. It saves handling—only one loading is required to complete all three steps.

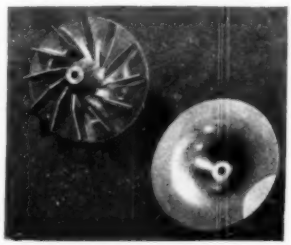
Those who are concerned with balancing of rotating parts have learned that it's wise to specify Gisholt.

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface finishing, and balancing of round and partly round parts. Your problems are welcomed here.



Showing front and back of fan with metal removed to correct unbalance. The entire balancing operation required an average of less than 45 seconds per piece.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SUPERFINISHERS • SPECIAL MACHINES

DOWNTIME BLUES ?

Use

BTR

THE SAFE-HARDENING TOOL STEEL FOR LONGER DIE WEAR

Downtime is time forever lost. Specify BTR (Bethlehem Tool Room) for those longer runs and cut your downtime by increasing production between grinds. BTR is high in wear-resistance. But it's an easy steel to machine. And heat-treaters like the way it hardens in oil from 1475 F with minimum distortion.

BTR is deep-hardening, holds a durable cutting edge. It's a general-purpose steel for a wide range of tools and dies. Best of all, BTR is economical. Try it on your next job and you'll probably find, as many others have, that it replaces several grades you're now using.

Call the nearest Bethlehem Tool Steel distributor or Bethlehem sales office. Prompt deliveries from local stocks.

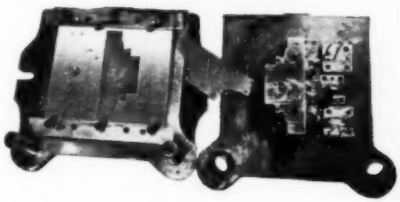
TYPICAL ANALYSIS:

C	Mn	W	Cr	V
0.90	1.20	0.50	0.50	0.20

HEAT-TREATMENT:

Anneal at 1450 F, furnace-cool, 202 Brinell
Harden at 1475 F, quench in oil
Temper from 325 to 400 F for a working hardness of 58 to 62, Rockwell C

AS AN EXAMPLE



. . . here's a blanking and piercing die—made from BTR—which produces end sections of 19-gage steel for fluorescent lamp fixtures. Its excellent wear-resistance is shown by the production of about 300,000 pieces between grinds. The dies will have a long life, for only 0.005 inch is removed when they are redressed, about three times a year.

Photo through courtesy of Westberg Tool and Manufacturing Co., Bridgeport, Conn.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

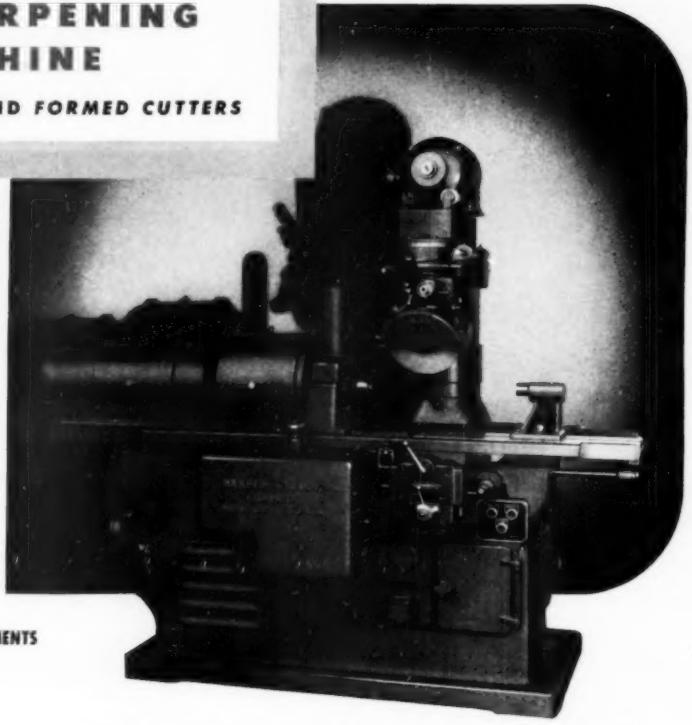
BTR . . . one of Bethlehem's fine tool steels

THE BARBER-COLMAN No. 10-12

Automatic HOB SHARPENING MACHINE

FOR *HOBS AND FORMED CUTTERS*

SEE THESE POSITIVE SHARPENING CONTROL FEATURES



AUTOMATIC MECHANICAL INDEX
HYDRAULIC TABLE STROKE
AUTOMATIC MECHANICAL FEED
VARIABLE LENGTH OF STROKE
TANGENT BAR LEAD CONTROL
PRECISION SETTING FOR FACE OFFSET
PRECISION DEPTH AND ANGLE ADJUSTMENTS

This machine is built for accuracy. Simple machine adjustments permit easy, quick set-up and place precision face sharpening of hobs and form cutters within the range of any operator. Heavy duty design and automatic operation provide precision mechanical control over all sharpening elements.

Get the complete story of the No. 10-12 Automatic Hob Sharpening Machine. See how it handles straight or helical work, large coarse pitch hobs, tapers, right or left shank tools and high helix angles. Ask for Bulletin 2119.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 2119 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

BARBER COLMAN

What's in
VERMONT
this month?

ONE BRYANT INTERNAL GRINDER SAVES 14,560 HOURS IN ONE YEAR.

A steel ring with a 24-inch I.D. and 10-inch length required 700 minutes floor to floor for finishing. Stock removal was about .070 inch. A new Bryant No. 150 with a five foot face plate was put on the job and finished the same pieces in 35 minutes, floor to floor.

One department estimated 16,640 hours grinding time for the coming year. On the basis of the above performance, this department's revised figure shows 2,080 hours grinding time to do the same amount of work, or a saving of 14,560 hours. This demonstrates clearly how important it is to check estimated pro-

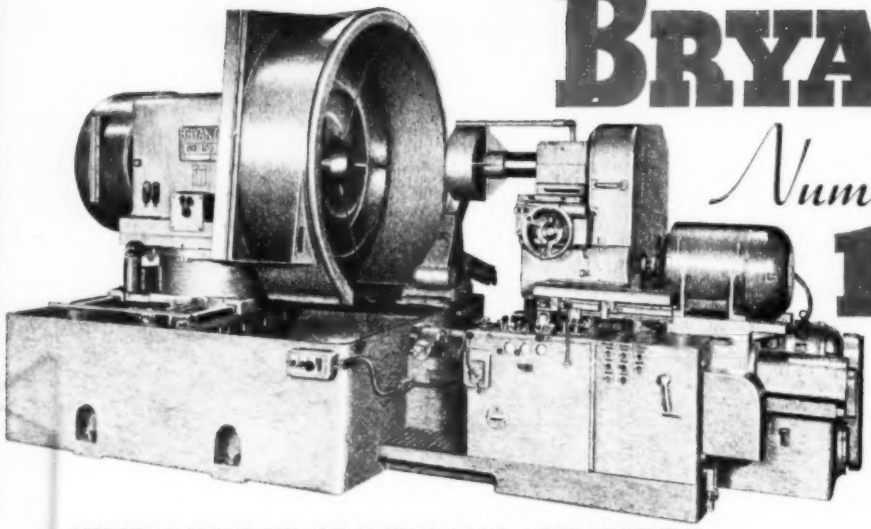
duction time on new available machines against the production time of the machines on your floor.

It won't cost to inquire.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

BRYANT

Number 150



HYDRAULIC INTERNAL GRINDER

The No. 150 with 60-inch maximum swing is the largest internal grinder in the Bryant line. Other Bryant equipment will grind holes through the complete range down to holes as small as ⅛-inch in diameter. Write to the factory for full information.

SPECIFICATIONS

Total swing	60 inches
Maximum traverse	21 inches
Maximum hole depth	16 inches
Will grind included angle	60°
R.P.M. of work spindle — 15, 25, 35, and 50 R.P.M.	
Net weight	12 tons
Floor space — 14 feet x 9 feet (with coolant tank)	

SLIDES
Bryant cylindrical steel slide.

WORKHEAD
Anti-friction bearings. 60-inch face plate. 9-inch through hole. 30-inch cross and 20-inch axial adjustment.

WHEELHEAD
Interchangeable quill type, belt driven, anti-friction bearings.

TRAVERSE
Infinitely variable, hydraulically powered.

CROSS FEED
Variable speed, hydraulically operated feedscrew.

You can *"See the Difference"* with a BRYANT GAGE

BRYANT PORTABLE INTERNAL THREAD GAGE. A fast, accurate, visual way to check threaded parts while still chucked in the machine. Also ideal for inspecting threads in large castings and pieces too heavy to move to the inspection department. Capacity of two models — $\frac{7}{16}$" to 1" and 1" to 3". Write for details.

It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

Send samples or drawings for a complete story on how Bryant can save inspection money for you.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

Now... Butterfield's

100% Inspected Tools Include the NEW FLEX-RITE REAMER!

Your production-reaming problems will be greatly simplified with Butterfield's new Flex-Rite reamer. Greater accuracy ... lower costs ... and higher production rates are made possible by Flex-Rite because the blade-expansion feature permits repeated sharpenings while maintaining original size 100%.

And remember, like all Butterfield tools, Flex-Rite reamers are 100% inspected ... *because only 100% inspection makes quality certain.*

See this latest addition to the Butterfield line at your nearby distributor. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec.

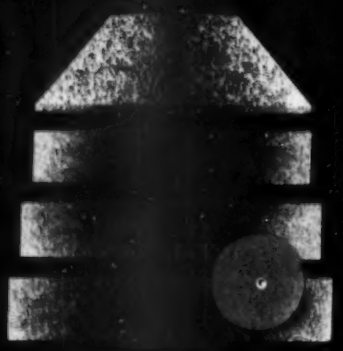
Testing hardness of finished tools on a Rockwell Hardness Testing Machine.

BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES



Put the bee on high grinding costs

Are you getting the longest possible life out of your grinding wheels? Are your dressing expenses as low as they could be, your stock removal still high?

Now is the time to sweeten your business with some good grinding procedures that will help lower your grinding costs. You can increase the efficiency of most of your grinding operations by consulting with a Peninsular engineer.

Over half a century of experience and research goes into Peninsular grinding recommendations. *Why not call on Peninsular experts to study your grinding jobs?*

First, they will conduct an on-the-ground analysis of your grinding machines, the methods you employ, and the materials you grind. Correct wheel formulas will then be drawn up and presented to you. Recommendations will be included which are designed to put the bee on high grinding costs and to increase your production.

Remember: Every prescribed Peninsular grinding wheel—resinoid or vitrified—is *custom-tailored to fit the individual job.*

The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7, Michigan. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

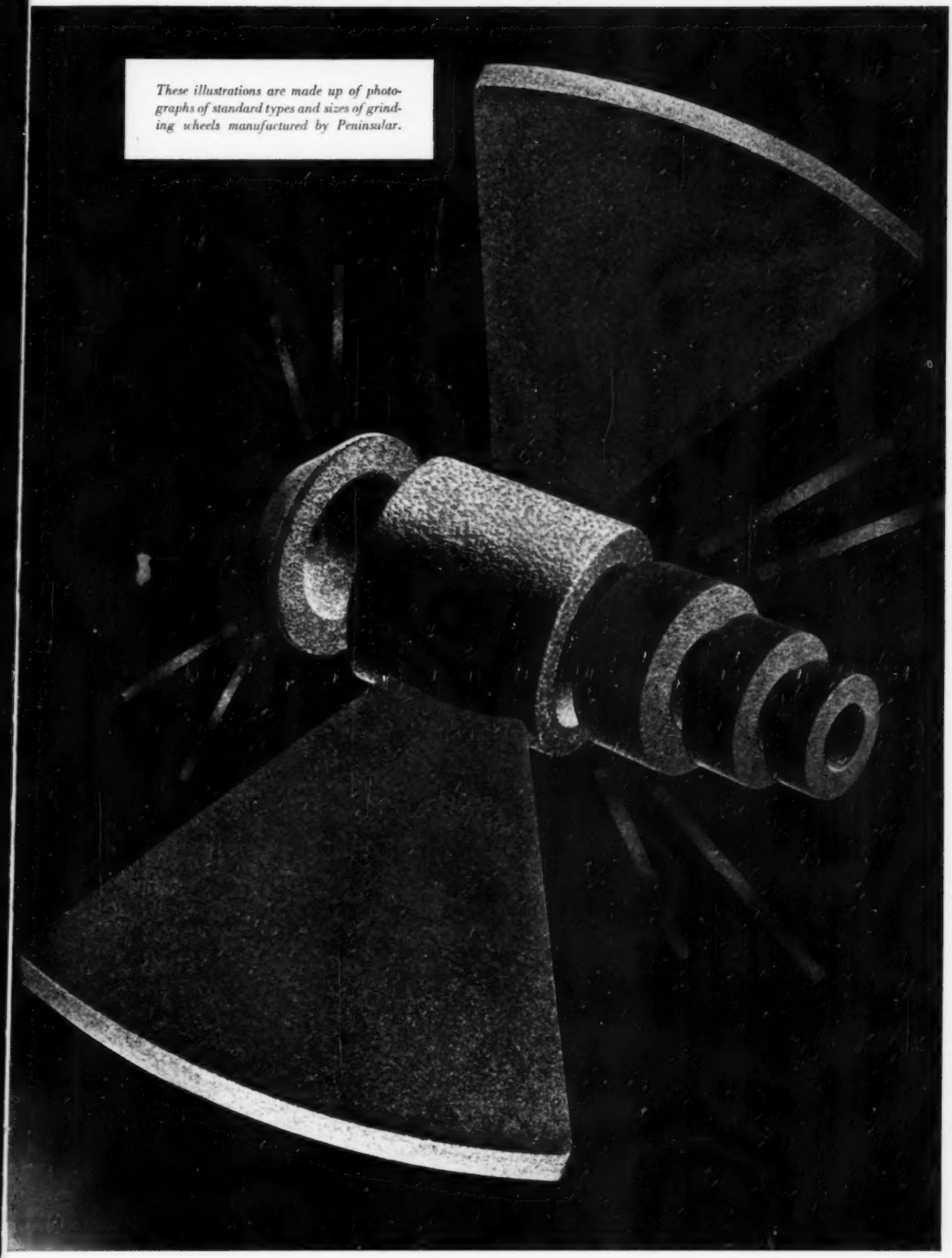
PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

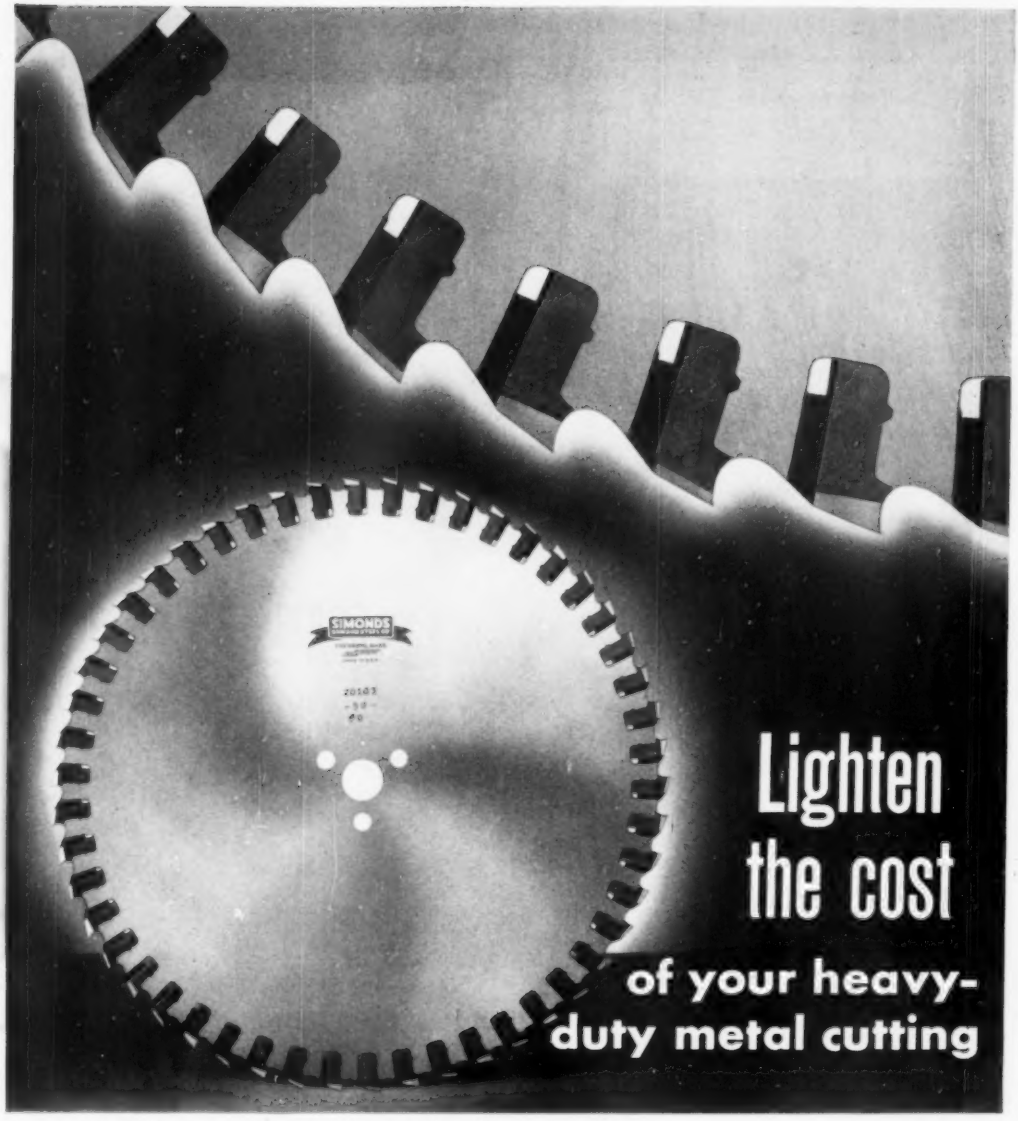
GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID AND VITRIFIED BONDED WHEELS



These illustrations are made up of photographs of standard types and sizes of grinding wheels manufactured by Peninsular.



...with the greater speed and feed you get from SIMONDS Inserted-Tooth Metal Saws

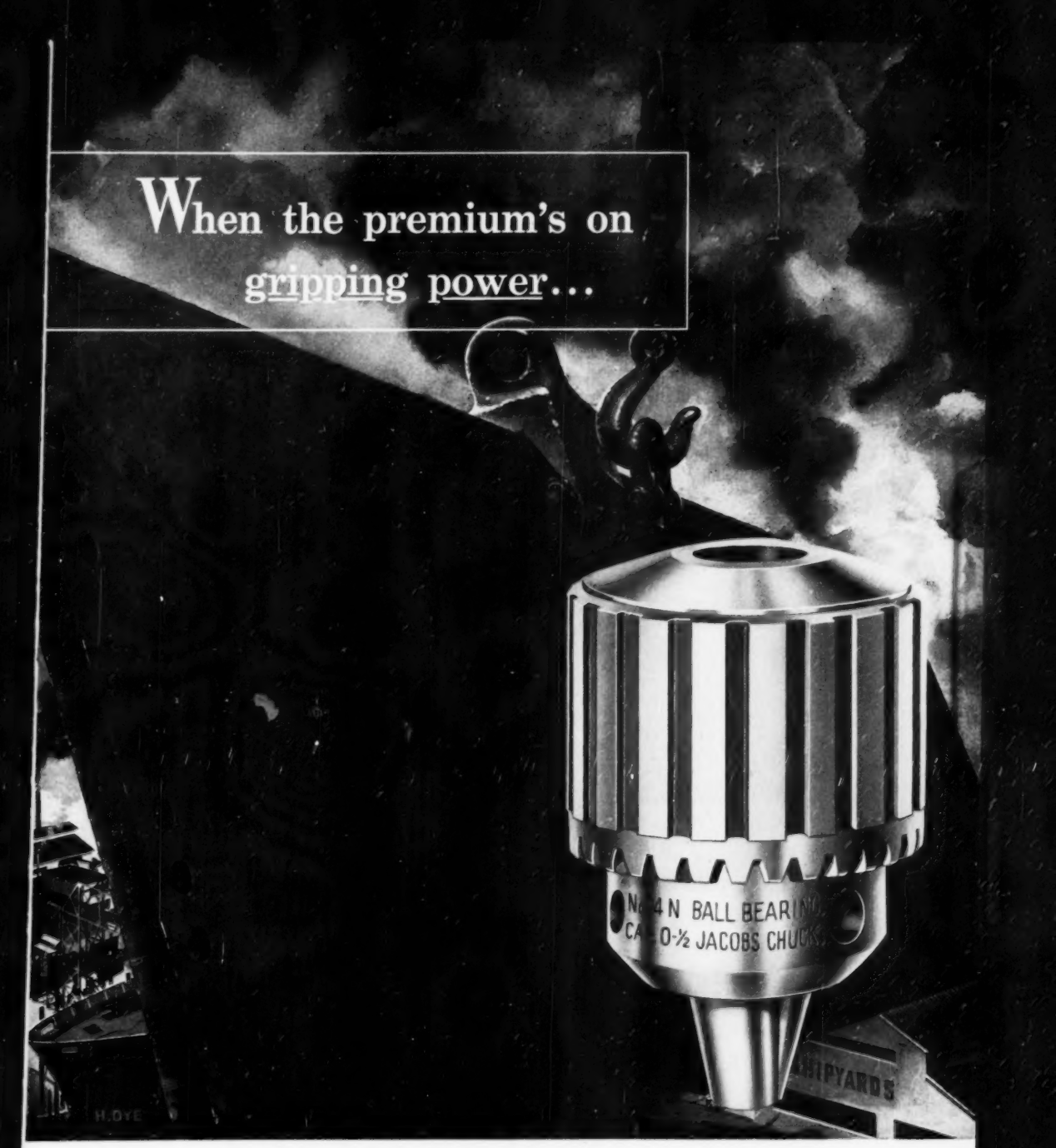
It takes Simonds Steels . . . especially hard for the teeth, especially tough for the plate; Simonds designed tools and machines; and many years of metal saw making experience to produce this heavy-duty metal-cutting saw. High Speed Steel Teeth with rounded gullets roll out chips which do not choke, bind or weld to the saw plate. Find out from your Simonds Distributor about these top quality Metal-Cutting Saws. Call him today.

INSERTED-TOOTH, SEGMENTAL, AND SOLID SAWS | FILES | METAL BANDS | FLAT GROUND STOCK | HACK SAW BLADES

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry

SIMONDS STEEL MILLS — Special Electric Furnace Steels
SIMONDS ABRASIVE CO. — Grinding Wheels and Grains
SIMONDS SAW (CANADA) LTD. — Simonds Products for Canada

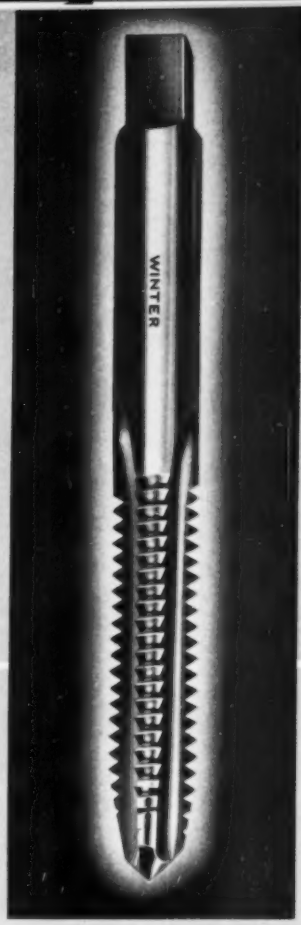
BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory*: 595 St. Remi St., Montreal 30, Que.



Jacobs Ball Bearing Super Chucks hold tools with the tightest practical grip ever devised. You will find their tremendous gripping power is in a class by itself. So friction-free you can tighten them by hand alone and equal the grip of any other key-operated chuck. Ball Bearing Super Chucks are stocked by your Industrial Supply Distributor The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

FOREMOST IN CHUCKS · FIRMEST IN GRIP ·

If it's a JACOBS, it holds **Jacobs Chucks**



WINTER TAPS IN ACTION

WINTER STANDARD MACHINE SCREW TAPS are used in place of fractional size hand taps in sizes below ¼". They are available from No. 0 (0.60" diameter) to No. 14 (.242" diameter) in carbon steel. In high speed steel they are stocked as follows: cut thread and commercial ground from No. 3 to No. 14; precision ground from No. 0 to No. 14. Winter also offers machine screw series chip driver taps (spiral point) in sizes No. 3 to No. 14 for use in through holes and in thin materials, where breakage might occur with regular style taps. The complete Winter line includes chip driver, hand, nut, pipe, pulley, stove bolt, and tapper taps, and a full selection of dies.

ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

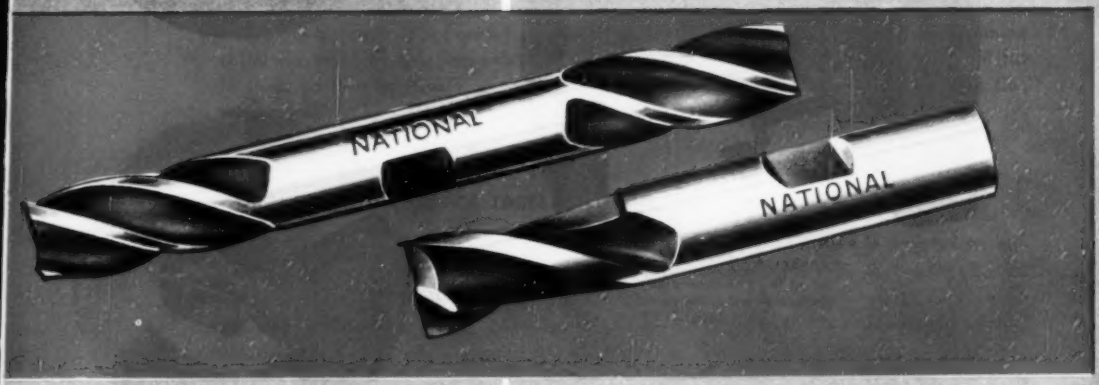
WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
Rochester, Michigan, U.S.A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

NATIONAL TWIST DRILL & TOOL ROCHESTER MICH. U.S.A.

National

METAL CUTTING TOOLS ON THE JOB

NATIONAL "HELEX" SINGLE END MILLS and DOUBLE END MILLS are recommended for milling slots, keyways and pockets, where arbor type milling cutters are unsuitable. They are designed with high helix angles of the cutting edges to promote smooth, efficient action. Because they are operated at high speeds, the danger of feed overload is lessened and breakage reduced. National also makes shell end mills, and taper and straight shank end mills. The complete National line of rotary metal cutting tools includes twist drills, reamers, counterbores, milling cutters, and hobs.



CALL YOUR DISTRIBUTOR

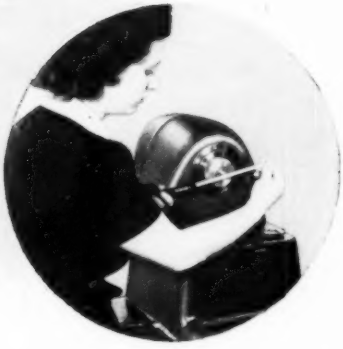
LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL metal cutting tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.

Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

NEW Polishing and Finishing Machine

CAPACITY . . . spindle takes collets for up to 1" diameter stock. Swing over bed 9¾" diameter; over rest, 7¾" diameter.



BROWN &

Here's 3-way improvement for your screw machine department

- ***Faster Burring***
- ***Faster Polishing***
- ***Faster Filing***

A NEW MACHINE FOR EFFICIENT POLISHING AND FINISHING OF SMALL PARTS

This new addition to the Brown & Sharpe line has three special features that make it extremely advantageous for general all-around polishing and finishing of small parts.

1. A compact, completely self-contained design that streamlines operations. It permits operator to work easily and comfortably when sitting or standing. Foot pedal control of collet and brake leaves operator's hands free to load, perform necessary operations and remove work.

2. Three spindle speeds... up to 4500 R.P.M. ... make it unusually flexible and versatile... suitable for a wide range of materials and operations.

3. Only the spindle is started and stopped for inserting and removing work—reducing inertia, wear, and motor heating. Constant speed motor runs continuously with V-belt drive released by the foot pedal.

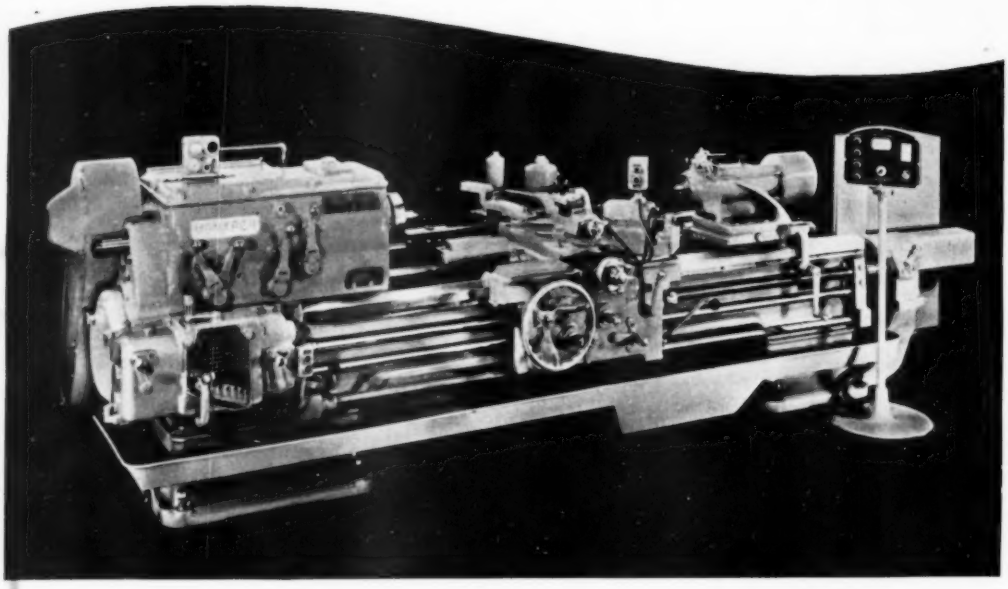
Here's an opportunity to round out the efficiency of your screw machine department with only a modest investment. Write for complete details. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

QUICK FACTS ON CONVENIENT FEATURES

1. Spindle driven by 3 step V-belt cone pulley enclosed by guard. Spindle is mounted on ball bearings. **2.** Spindle nose is threaded for chuck or other workholding device. **3.** Readily adjusted tool rest for burring, hand shaving, etc. **4.** Convenient work tray provides ample space for work pieces. **5.** Knee space permits sitting comfortably at work. **6.** Convenient start-stop switch for driving motor. **7.** Spindle speeds quickly changed through V-belt and cone pulleys. **8.** Built to typical Brown & Sharpe quality standards that assure extra years of productive service.

SHARPE B·S

OUR TWENTIETH YEAR



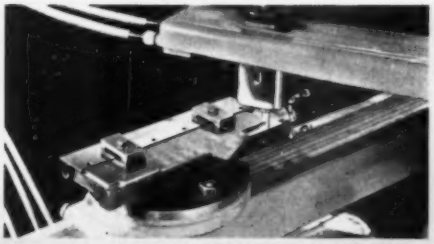
HERE ARE MONARCH'S 3 TYPES OF TRACER CONTROLS

1. "AIR-GAGE TRACER"—Hydraulically operated, controlled on air-gaging principle. Applied as factory equipment on standard lathes, such as the 20" Model M Engine Lathe illustrated above—and on the Monarch Mona-Matic and Uni-Matic single spindle automatic lathes for chucking and between centers work. Recommended for turning multiple diameter shafts and for turning, boring or facing of contours.

2. MOTOR-TRACE—Electric motor operated, electric tracer controlled. Applied as factory equipment on all sizes of Engine and Toolmaker's Lathes. Recommended for long, heavy shaft work with straight multiple diameters. Applied to the automatic cycle, double carriage Magna-Matic, it is ideal for large or small lot runs of medium size work pieces.

3. MONARCH-KELLER—Magnetic clutch operated, electric tracer controlled. Employs template for form turning, boring or facing. Also used with Monarch Shapemaster and Shapemaster Engraver for work pieces with diameter variations.

Typical Monarch Tracer Control employing a template to guide the cutting tool.



Diameter gauge blocks used with the Motor-Trace for straight diameter work.

FOR A GOOD TURN *FASTER* — TURN TO MONARCH

with TRACER-CONTROLLED LATHES!

Brings these exclusive Advantages to you

★ **TURNING, BORING, FACING**—Monarch offers this complete variety of tracer-controlled lathe operations. They may be performed singly or in any required combination. With this versatility you can get the benefits of money-saving, time-saving tracer controls on *every* lathe operation.

★ **ALL FOUR METHODS OF TRACER DUPLICATION**—From templates, from gauge blocks, from micrometer heads, from master work pieces, one or more being applicable to each of the three types of controls. With a long background of experience covering all four of these methods, Monarch is qualified to make unbiased recommendations as to the one best suited to *your* needs.

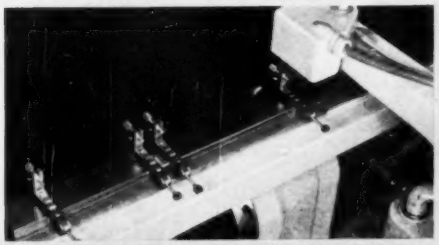
★ **ANY SIZE AND TYPE OF WORK PIECE**—At least one type of tracer-controlled machining is available for application on every lathe in the Monarch line—from the largest to the smallest. Within this range there is almost no limitation as to the size or type of work piece that can be machined by this method.

★ **YEARS OF EXPERIENCE**—Since Monarch pioneered the first tracer-controlled lathe in 1930, hundreds of each of the various types have been built and sold. During the intervening years this unequaled experience has been responsible for numerous refinements and one completely new approach. This equipment has in the past and will in the future continuously keep pace with the ever-changing needs of lathe users.

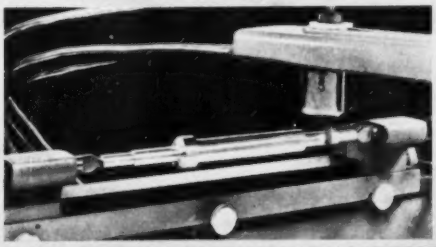
ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES

Tracer-controlled duplication of parts on a lathe is not new—at least, not at Monarch! We have long recognized its value for accurate, economical, high-speed machining. This simple truth is important to you. It means that in the tracer field as in most fields of metal turning, you can look for *peak production at a profit* when you look to Monarch. We ask for nothing more than the opportunity to demonstrate that this is no idle claim by showing you how Monarch tracer-controlled lathes can *save money for you.*

Micrometer gauge blocks also used with the Motor-Trace for straight diameter work.



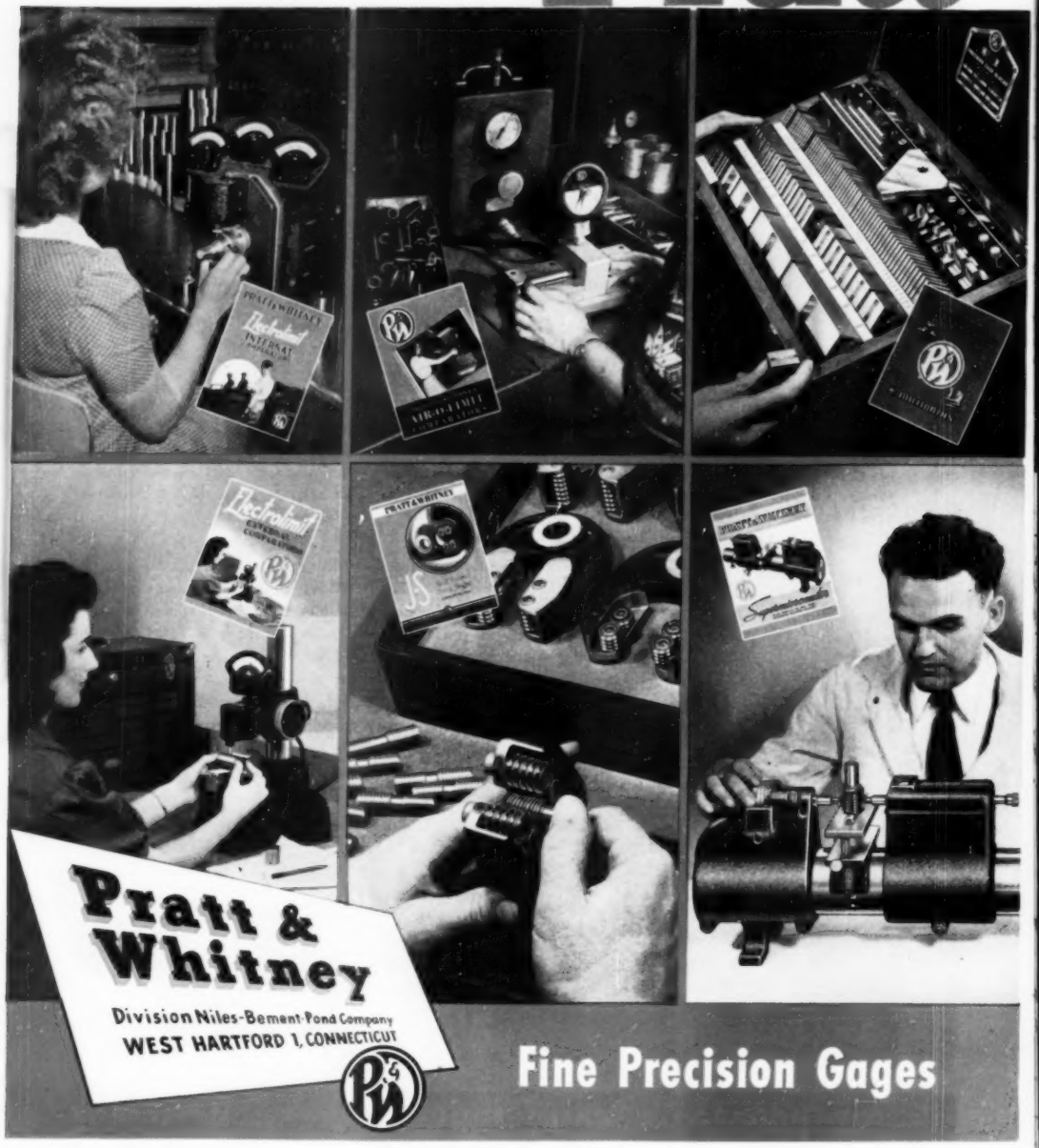
A master work piece is sometimes preferred, especially for one-time, few-of-a-kind jobs.



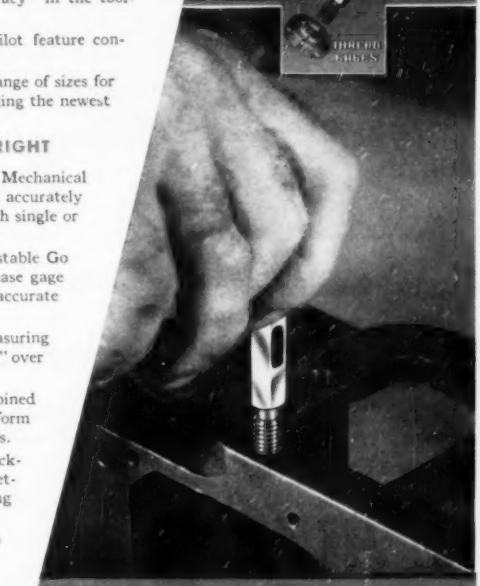
THE MONARCH MACHINE TOOL COMPANY · Sidney, Ohio

GAGES like these . . .

from ACCURACY HEADQUARTERS can safeguard your products — reduce your costs . . . . . Pratt . . . .



...&Whitney



Eighty-nine years of pride in craftsmanship are manifest in the metallurgical and precision skills that give you absolute confidence in these instruments. You therefore *know* that any precision Gage bearing the name Pratt & Whitney is worthy of the responsibility of guarding *your* product's reputation. Each of these pictures tells its own story of precision at work — examine them carefully, then ask for the Bulletins that fit your gaging requirements.

TOP ROW — LEFT TO RIGHT

MULTIPLE STATION ELECTROLIMIT COMPARATORS — Specially designed to inspect several dimensions on one part simultaneously to "tenths".

AIR-O-LIMIT COMPARATORS — Precision gaging by direct readings in "tenths" from units coupled to compressed air supply. Also special types, combining P&W Electrolimit and Air-O-Limit principles for fast, multiple gaging.

P&W PRECISION GAGE BLOCKS — Your master-standard for precision: "millionth accuracy" in the toolroom, in the shop.

P&W CYLINDRICAL PLUG GAGES — Pilot feature contributes greatly to ease of gaging.

P&W THREAD RING GAGES — Large range of sizes for reliably accurate thread-gaging, including the newest carbide Dualock Thread Ring Gages.

BOTTOM ROW — LEFT TO RIGHT

P&W ELECTROLIMIT COMPARATORS — Mechanical gaging with electrical magnification to accurately check output at high speeds. Available with single or multiple stations, Internal or External.

P&W ROLL THREAD SNAP GAGES — Adjustable Go and Not Go rolls rotate on contact to increase gage life and retain original accuracy. For rapid, accurate inspection of external threads.

P&W SUPERMICROMETER — Ultra-precision measuring machine for direct, accurate readings in "tenths" over a range of 9 inches, using controlled pressure.

P&W SNAP GAGES — Go and Not Go limits combined in one versatile instrument. Two models: Trusform with bakelite grip, and the economical AGD models.

P&W THREAD PLUG GAGES — Complete line for checking all thread forms: Go and Not Go, Full Form Setting, Truncated Setting, Wear Limit, Carbide Plug and Chromium plated types.

BESIDES THE P&W GAGES ILLUSTRATED ON THESE PAGES . . .

Pratt & Whitney is Headquarters for all types of Precision Gages and Gaging Equipment. A detailed listing appears in the P&W Gage Catalog No. 11, plus considerable helpful information to guide you in the selection of the proper equipment for your gaging operations. Your copy will be mailed for the asking, without obligation.

BRANCH OFFICES — Birmingham • Boston • Chicago • Cincinnati • Cleveland • Detroit • Los Angeles • New York • Philadelphia • Pittsburgh • Rochester • St. Louis • San Francisco

Can you compete? Better investigate the new GRAY PLANER

PRODUCTION *demands* POWER *and* SPEED

This new GRAY Planer is a real cost cutter. No wonder the chips pile up as the costs go down—

300 ft. per minute cut and return speed—

2 heads cutting with modern carbide tools—

¾" depth of cut with .110" feed—

120 HP required to remove metal at the rate of 594 cubic inches per minute.

Result—4 Kirksite special auto dies in record time at low cost—

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

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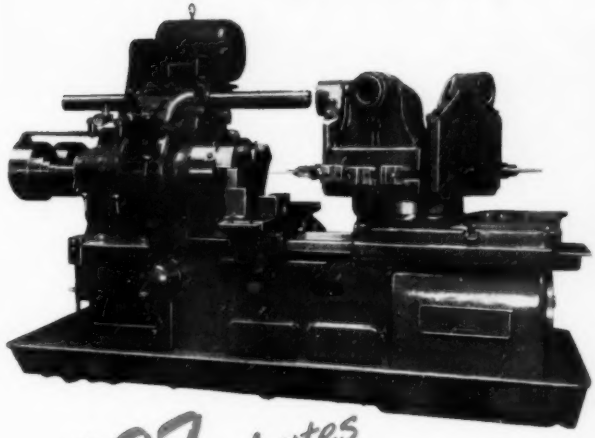
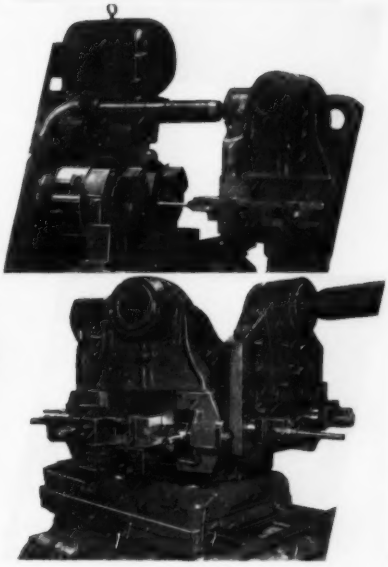
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

2 at a time $AVES TIME





4.37 minutes on the P&J 5D2-15 AUTOMATIC

Responsibility for performance of this calibre rests with P&J tooling experts. They know how to engineer the tooling to produce duplicate parts in minimum time, accuracy considered.

In this case there are fifteen operations on each of two pieces in the remarkable floor-to-floor time of 4.37 minutes. This gives you an idea what the P&J 2-spindle Automatic—with turrets and slides tooled the P&J way—can do for you. Send us your prints or parts for estimates.

SEQUENCE OF OPERATIONS
AS TOOLED BY POTTER & JOHNSTON

1st TF — Rough bore three diameters. Face shoulder.

2nd TF — Rough face front side, divided cut.

3rd TF — Finish bore three diameters. Form bevel. Machine 3.009" diameter.

4th TF — Finish face front side. Machine groove in bore.

5th TF — Ream three diameters.

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

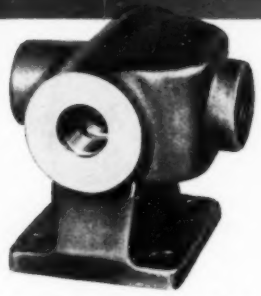
P&J

AUTOMATIC TURRET LATHES

Hydraulic Controls or Valves

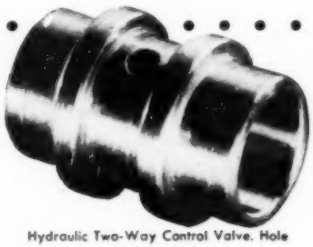
SUNNEN HONING

Bronze Remote Control Valve Body. Time saved in producing smooth, accurate surface finish.



Valve Body. All lands are honed straight, round, and to exact size.

Hydraulic Pump Cylinder — Good finish, satisfactory speed, tolerance held to .0001"



Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Bronze Valve. Sunnen Honing eliminates leakage, increases life of part.

Valve Body. All lands honed without bell-mouth or taper.

SUNNEN HONING

Low Cost Production of Accurate Holes

on Your Products . . . ?

Assures You Greater Accuracy—Lower Cost

Smooth, positive operation and long life of hydraulic controls depend upon cylinders that are absolutely straight and round — and upon smooth, long-wearing surface finish.

Sunning Honing Machines produce geometrically true holes, combined with any surface finish which you may require. Lands of the same diameter are held in perfect alignment.

The result is reduced friction, smoother operation, faster assembly of parts, longer service life and reduced maintenance — at greatly reduced production costs.

If producing accurate holes for rotating, sliding or reciprocating parts is your goal, Sunnen Honing can help you.

Write today for Bulletin MB-5

SUNNEN PRODUCTS COMPANY

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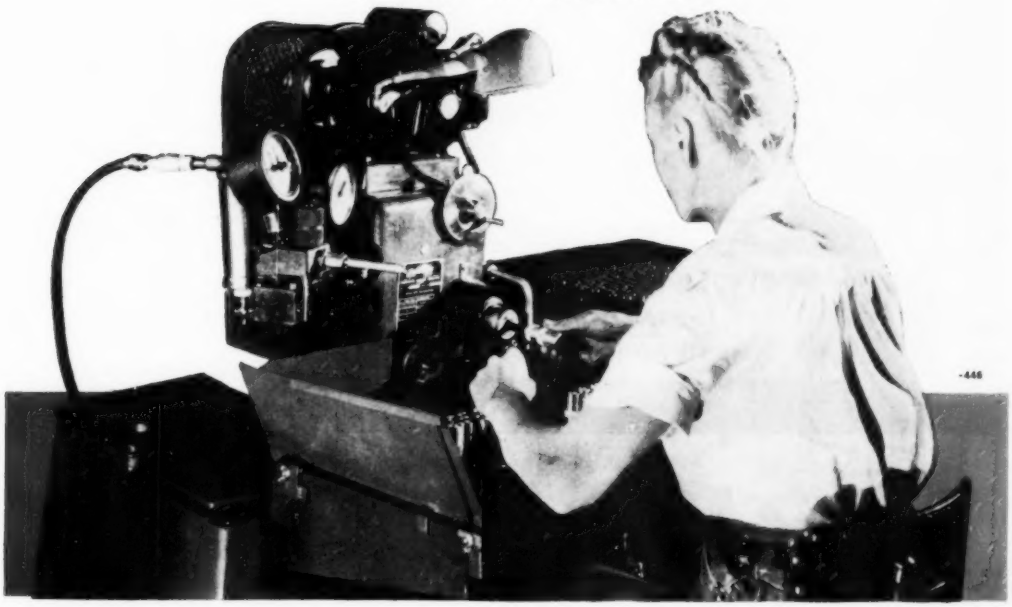
CANADIAN FACTORY: CHATHAM, ONTARIO



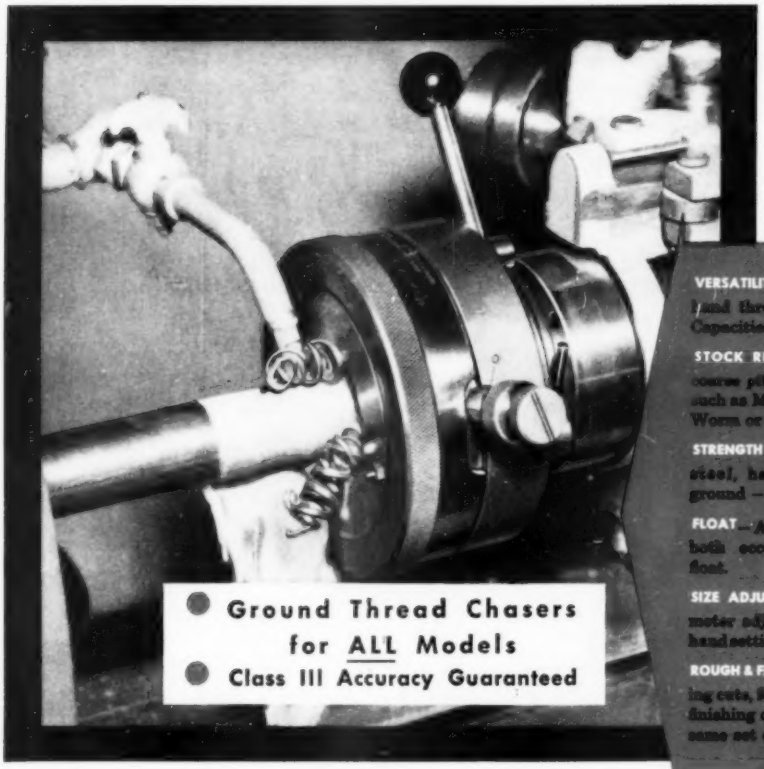
-446

Jones & Lamson

Ground Thread Chasers for 25 years!

FIRST and FINEST...

All models of Jones & Lamson RADIAL TYPE Automatic Opening Threading Dies are equipped with GROUND THREAD CHASERS. They are the ideal investment for general threading work involving relatively small lots and diversified pitches. They will lower your tooling inventory too, because standard chaser sets are immediately available from factory stock.



RADIAL DIE HEADS

VERSATILITY – Will cut right or left hand threads, coarse or fine pitch. Capacities from No. 8 to 4¼".

STOCK REMOVAL – Unbeatable for coarse pitch, heavy duty threading such as Modified Square, 29° Acme, Worm or other threads.

STRENGTH – Every part is of solid steel, hardened and precision ground – no built-up sections.

FLOAT – All models are built with both eccentric and longitudinal float.

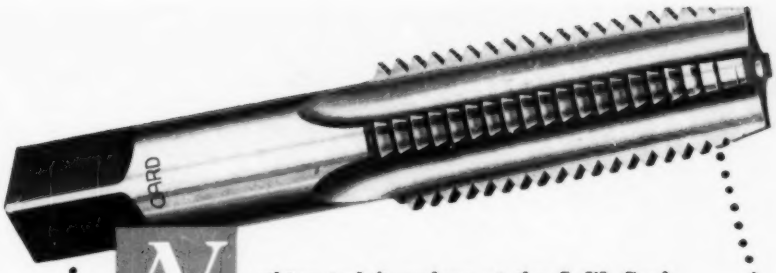
SIZE ADJUSTMENT – External micrometer adjusting screw for precise hand setting to exact pitch diameter.

ROUGH & FINISH LEVER – Heavy roughing cuts, followed by light, accurate finishing cuts can be taken with the same set of chasers.

Jones & Lamson

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies



Nothing is left undone at the S. W. Card Manufacturing Company's factory at Mansfield, Massachusetts, to insure that every tap reaching your hands is 100% perfect . . . ready to give you top performance over a long service life.

But to make *doubly sure* of your continuing satisfaction we have retained the outstanding PITTSBURGH TESTING LABORATORY to buy Card Taps periodically on the open market *anywhere in the United States* . . . and subject them to rigorous tests to make *certain* that Card Taps reaching the market are right up to standard!

No wonder increasing numbers of metal-working plants whose production schedules *demand* accurate, dependable cutting tools are turning to Card.

And for fast, dependable service that saves you time and money, contact your nearby Card Distributor.

CHECKED HERE BY CARD

DOUBLE CHECKED HERE BY PITTSBURGH TESTING LABORATORY — ENGINEERS AND CHEMISTS

S. W. CARD

MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL CO.

CARD Quality

TAPS

The Certified Cutting Tools*

*by the Pittsburgh Testing Laboratory

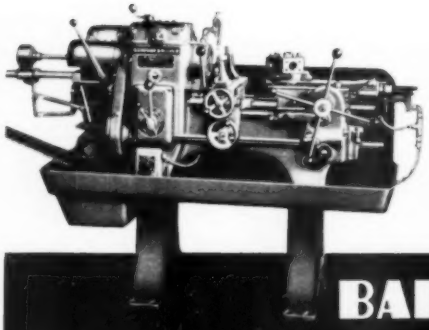
Also makers of DIES • SCREW PLATES
DIE STOCKS • TAP WRENCHES

A Poppet every 29 seconds!

This *Outstanding Production* achieved by the ELECTRIC REMOTE CONTROL...

The BARDONS & OLIVER No. 2 Geared Electric Turret Lathe is built for fast production of small parts.

The two-jaw air chuck is opened by the backward travel of the slide. A loader on the turret positions the work in the chuck and closes it automatically. The spindle is started and stopped and the electric plugging brake is applied thru remote control by the turret slide travel.



If you are manufacturing parts of a similar nature, why not let us offer production estimates based on BARDONS & OLIVER Turret Lathes and tooling?

We build a complete line of ram and saddle type turret lathes and also a comprehensive line of cut-off machines.

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

SINCE 1909

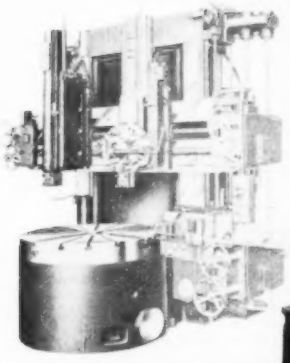
1909 · 1949

40 years of UNIVERSAL BORING DRILLING and MILLING precision carried on by . . .

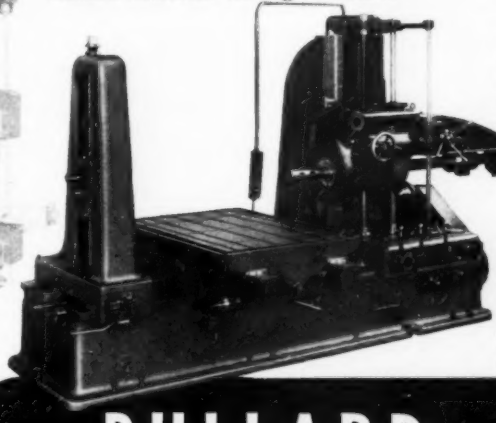
Bullards'

70 Years of ENGINEERING EXPERIENCE

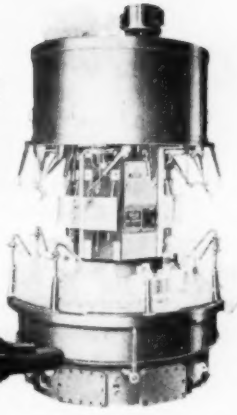
Extensive Machine Tool Experience with modern manufacturing facilities turns its hand to the field of Horizontal Boring. Bullard-*Universal* Boring Machine.



THE MODERN VERTICAL TURRET LATHE. Bullard Cut Master in 30-36-42-54-64 and 74-inch sizes.



BULLARD-UNIVERSAL BORING MACHINE 3"-4" or 5" Spindles with several varying bed lengths and post heights.



THE MULT-AU-MATIC Type "D" 8-12-16-inch with 6 or 8 spindles. Type "K" 8" with 6-8-12 or 16 spindles.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

The Right Combination

YOUR BLANCHARD
BLANCHARD WHEELS
BLANCHARD SERVICE

Blanchard Wheels for Blanchard Grinders are designed and manufactured under the same supervision which for one-third of a century has produced Blanchard Surface Grinders.

Those years of experience are available to help Blanchard users get the utmost in Service from their Blanchards.

Call upon us for advice, sample grinding, or personal call by our Service Department, or our local well-known Distributor.

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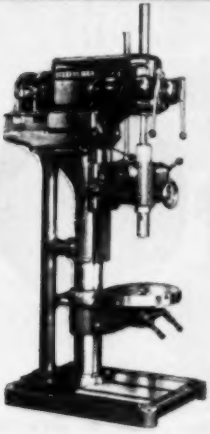
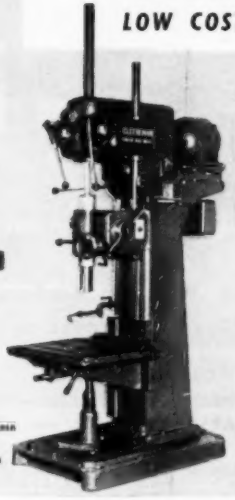
CLEEREMAN DRILLING MACHINES

FOR SPEED — ACCURACY —ADAPTABILITY— LOW COST PRODUCTION

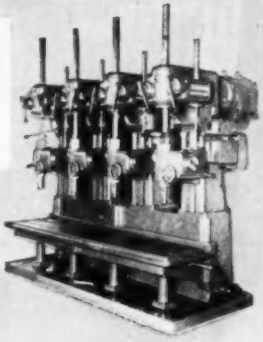


Cleereman Round Column Sliding Head Drilling Machines



Cleereman Box Column Sliding Head Drilling Machines

Cleereman No. 325 Single Unit Sliding Head Drilling Machine



Cleereman Multiple Drilling Machines

1900 - 1949 40th Anniversary CLEEREMAN MACHINE TOOL CO.

Cleereman builds a complete line of drilling machines for production work. All have won wide acceptance both here and abroad. All are noted for their high standards of performance, wide adaptability and extreme ease of operation.

The new No. 325 Single Unit Sliding Head Drilling Machine provides extreme sensitivity with rugged construction and is characterized by facility of control, exceptional flexibility and easy set-up.

Cleereman Round Column Sliding Head Drilling Machines are built in 25" and 30" sizes with a wide range of speeds and feeds. They are sturdy, precision built machines readily adapted to a wide variety of manufacturing operations.

Cleereman Box Column Sliding Head Drilling Machines in both 25" and 30" sizes have the stamina and accuracy necessary to meet the severest requirements of production work.

Cleereman Multiple Drilling Machines are available to meet individual production requirements for high speed production with accuracy and convenience.

Wire or write for Catalogs and complete specifications.

Address — BRYANT Machinery & Engineering Company — General Office 400 West Madison Street, Chicago 6 — Representatives in Principal Cities

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CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

The New Van Keuren

7/8" DIAMETER MICROGAGES are the best buy . . . . . .

Shop Set MTT . . . 35 blocks giving 140,000 combinations in ten thousandths. Price in mahogany case, $100.00.
Economy Set MT . . . Over 5000 combinations in thousandths. Price in mahogany case, $40.00.
Micrometer Set M21 . . . Includes 1", 2", 3", 4", 5" and 6" Microgages. Price in mahogany case, $60.00.
Toolmakers Set M64 . . . Gives 121 combinations in 16ths, 32nds and 64ths. Price in mahogany case, $17.50.

60% More Wearing Surface . . . 25% Greater Accuracy . . . No increase in price.

A FOUNDATION FOR ACCURACY FOR 25 YEARS

Van Keuren Microgages have been popular for over 25 years, because they provide a low cost means of securing accuracy in the shop, to meet the demands of the inspection department. The original Microgages were made 11/16" in diameter. The 7/8" body diameter of the NEW Microgages are ground true cylinders, and the end surfaces are held square with the body within close limits. This enables them to be easily aligned on machine ways for measuring carriage travel. The new Microgages have 40% more wearing surface than rectangular gages and they wring together tenaciously. The 7/8" diameter body provides excellent rigidity for the 6" long blocks.

Microgages up to 1" length are held within a tolerance of plus 12 millionths minus 8 millionths. They have an average wear allowance of 4 millionths oversize. They are available as individual gages from .0625" to 6" length, or in sets especially designed for general shop use, for tool setting and for tool makers and machinists.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

for your information

the BULLARD complete line

CUT MASTER VERTICAL TURRET LATHES

MAN-AU-TROL VERTICAL TURRET LATHES

MAN-AU-TROL HORIZONTAL LATHES

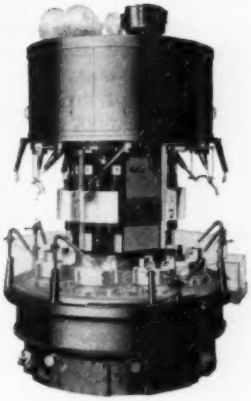
MULT-AU-MATIC Type "D"

CONTIN-U-MATIC Type "A.D." "A.D.H."

MULT-AU-MATIC Type "V"

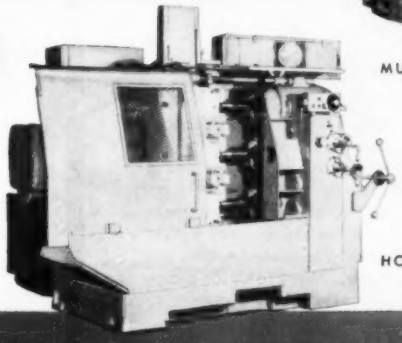
BULLARD SPACER 3 Stand

BULLARD UNIVERSAL BORING MACHINE



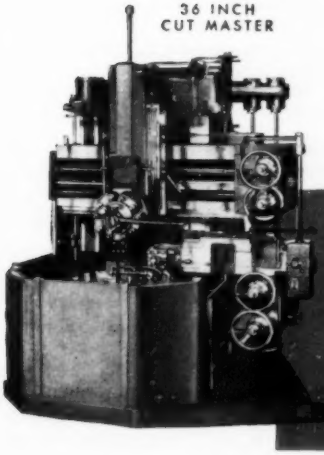
TYPE "D" MULT-AU-MATIC

BULLARD



30-H HORIZONTAL LATHE

36 INCH CUT MASTER



THE BULLARD COMPANY

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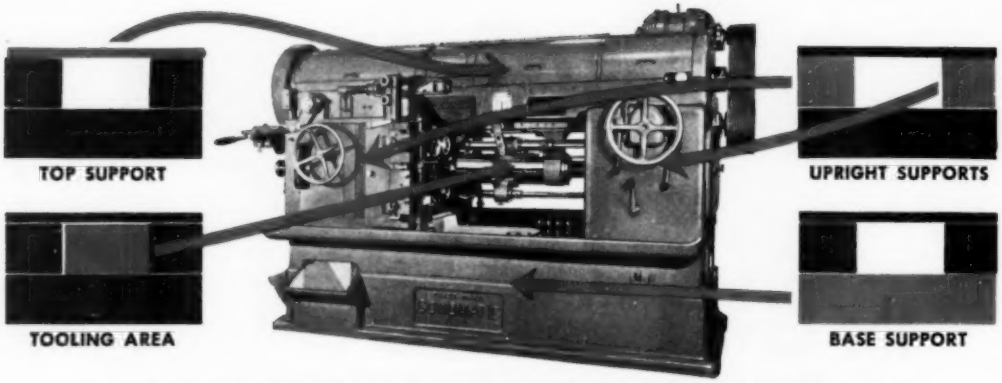


GOOD DESIGN IS CONSISTENTLY GOOD

All builders of horizontal type multiple spindle automatic bar machines emphasize the importance of substantial frame support to maintain work and tool alignment and insure durable low-cost machine performance. Some have stressed the advantages of box-type frame design and construction. But only Cone has consistently applied these fundamentals by providing a horizontal, rectangular tooling area for a horizontal type machine.

Two frame designs for horizontal type multiple spindle automatics were submitted to automatic users to meet the general requirements here listed. The 100% choice is illustrated above. The Conomatic is its sole representative.

	MACHINE #1*	MACHINE #2	MACHINE #3	MACHINE #4	MACHINE #5
WORK & TOOL CAPACITY	✓				
WORK & TOOL SUPPORT	✓				
WORK & TOOL MAINTENANCE	✓				

*CONOMATIC

Any good investment has certain qualifications that prove it profitable. The wise investor and smart banker have some sort of measuring stick to analyze every investment they make. Why not use a chart to guide your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask your Cone representative.

WORK & TOOL CAPACITY

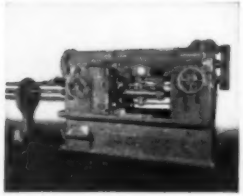
Long, open, roomy Tooling Area and long main end slide for handling longer work and for clearing die heads in threading, etc., to the full collet capacity of the machine; for heavy cross-slide cuts, deep hole drilling, and general all-round work with HSS or Carbide Tools.

WORK & TOOL SUPPORT

Genuine, horizontal, rectangular box-frame free of overhang; heavy-set, rigid upright members for supporting headstock and gear box units between heavy, full-length top and base members, for substantial support of all work and tools close to the work and tool axis, and for the maintenance of accurate alignment of work and tools.

WORK & TOOL MAINTENANCE

Heavy, strong, well supported, overhang-free, vibration-free, liberal bearing, convenient, adjustable, work holding units and tool slides, with accessible chip-free cams, with adequate capacity in base member for chip disposal and cutting coolant.



A comparison with ALL Automatics will lead you to

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

How TIMKEN® bearings help keep vibration out of railroad axle lathes

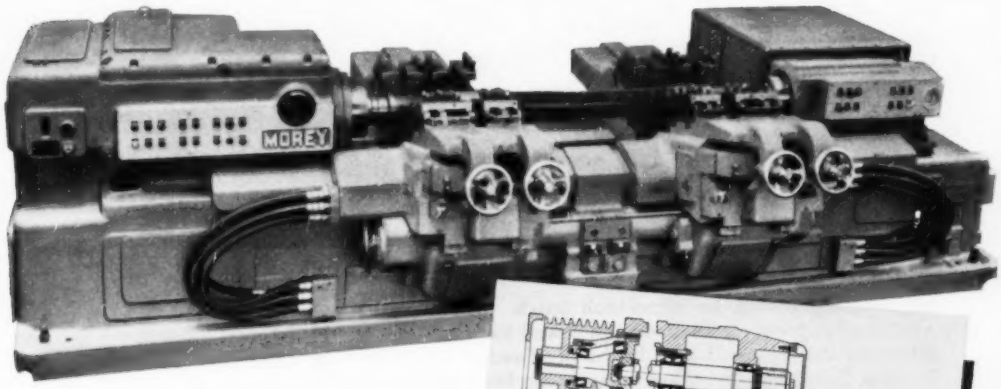
THE Morey Automatic Railroad Axle Lathe is designed to rough or finish turn railroad axles in two to three minutes. The extreme rigidity of this 58,000 lb. machine, plus the use of Timken® tapered roller bearings throughout the headstock, makes possible multiple tooling with tungsten carbide tools at maximum efficiency and assures smooth, vibration-free turning of even the most eccentric forgings. The main spindle drive is designed to transmit 150 H.P. in continuous duty, allowing for momentary overloads up to 225 H.P. Close tolerances are constantly maintained during finish turning.

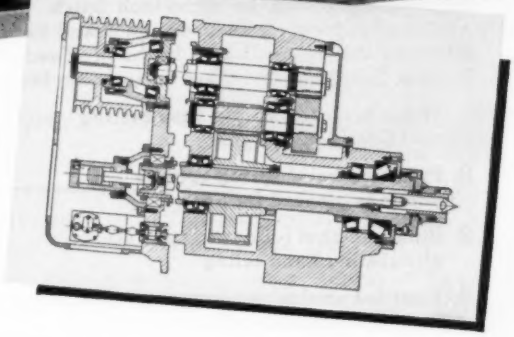
The tapered construction of Timken tapered bearings enables them to carry the lathe's 50,000 pound thrust load, plus radial loads, without end-play or deflection. Headstock shafts are held in rigid alignment and all possibility of chatter is eliminated.

Power loss is minimized because Timken bearings have true rolling motion for frictionless operation. Timken bearings are made of special analysis Timken fine alloy steel and are manufactured to almost incredible limits of accuracy. Quality is constantly and rigidly controlled.

No other bearing can give you *all* the advantages you get with Timken tapered roller bearings. Whether you build a machine or buy it, always look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



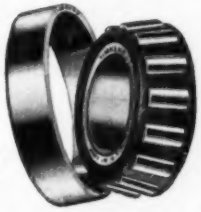


The **MOREY MACHINERY CO., INC., ASTORIA, N.Y.,** *uses 9 Timken bearings in lathe headstock to keep shafts and spindle in perfect alignment and to carry 50,000 pound thrust load.*

GENERATED UNIT ASSEMBLY

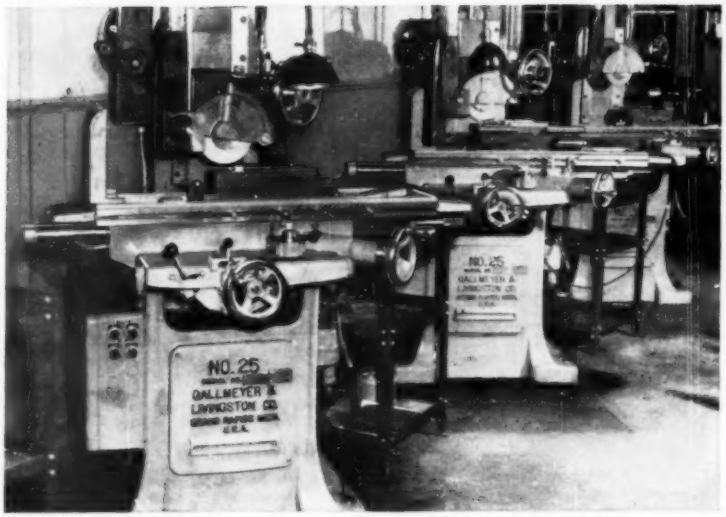
An extra step in the manufacture of Timken bearings—after assembly—results in a natural and true geometric contact being generated between all rotating parts. This perfect mating of the component parts—cone, rolls and cup—assures positive roll alignment, long lasting precision, permanent adjustment and smooth operation.

TIMKEN
TAPERED
ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL AND THRUST ◎ LOADS OR ANY COMBINATION

Enthusiastic Customers do our BEST advertising



In one of the world's largest electrical equipment plants, three of a battery of eight Grand Rapids No. 25 Hydraulic Feed Surface Grinders precision grinding lamination dies for motor stators.

You will appreciate the micro-inch finish produced at production speeds on Grand Rapids Grinders. All Grand Rapids Hydraulic Feed Surface Grinders have these outstanding features:

1. **One-piece column and base casting for vibrationless rigidity**
2. **Precision ball-bearing spindle which is greased for life**
3. **Bijur one-shot lubrication system eliminating hand oiling**
4. **Patented vertical movement of wheel head for quick, accurate adjustments**
5. **Portable coolant tank for ease of coolant replacement**
6. **Vane type hydraulic pump for fast longitudinal table travel**

to serve you—

Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Drill Grinders, Tap Grinders, and Combination Tap and Drill Grinders.

GALLMEYER & LIVINGSTON
COMPANY

330 Straight, S. W., Grand Rapids 4, Mich.

GRAND RAPIDS GRINDERS

"FORMING OF AUSTENITIC CHROMIUM-NICKEL STAINLESS STEELS"

A Detailed, Authoritative Book

This new volume of more than three hundred 8¼" by 11" pages describes in detail, modern forming techniques as applied to austenitic chromium-nickel stainless steels. Tables of engineering data and more than two hundred engineering drawings are used to supplement the text.

Contents

★

MECHANICAL PROPERTIES OF CHROMIUM-NICKEL STAINLESS STEELS

FORMING CHARACTERISTICS OF AUSTENITIC STAINLESS STEELS

PROCESSING AFTER FORMING

DESIGN, LAYOUT AND PREPARATION OF BLANKS

EQUIPMENT, TOOLS AND LUBRICANTS

BENDING AND STRAIGHT FLANGING

THE FORMING OF CURVED SECTIONS AND TUBING

FORMING OF CONTOURED-FLANGED PARTS

DEEP DRAWING OF CUP-SHAPED, BOX-SHAPED AND RELATED PARTS

DOUBLE-ACTION DIE FORMING OF DEEP- AND SHALLOW-RECESSED PARTS

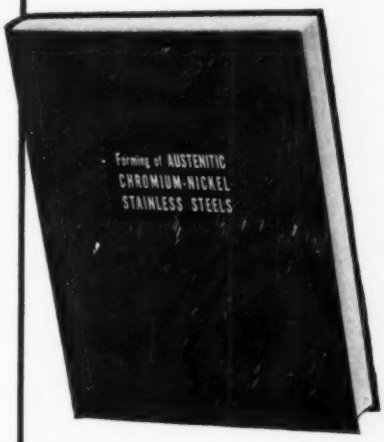
FORMING OF DEEP- AND SHALLOW-RECESSED PARTS BY MISCELLANEOUS METHODS

FORMING OF SEMITUBULAR PARTS

EXPANDING AND REDUCING OF TUBULAR PARTS

Unexpected demand has exhausted the first two printings, but copies of the third printing may now be purchased through The International Nickel Company, Inc.

USE COUPON BELOW



Fabricators, Designers, Engineers and Others will find this book valuable.

THE INTERNATIONAL NICKEL COMPANY, INC.
Department AM, 67 Wall Street, New York 5, N. Y.

Gentlemen: Please send me.....copy (copies) of "Forming of Austenitic Chromium-Nickel Stainless Steels" at four ($4.00) dollars per copy.

☐ CHECK ENCLOSED ☐ BILL MY COMPANY

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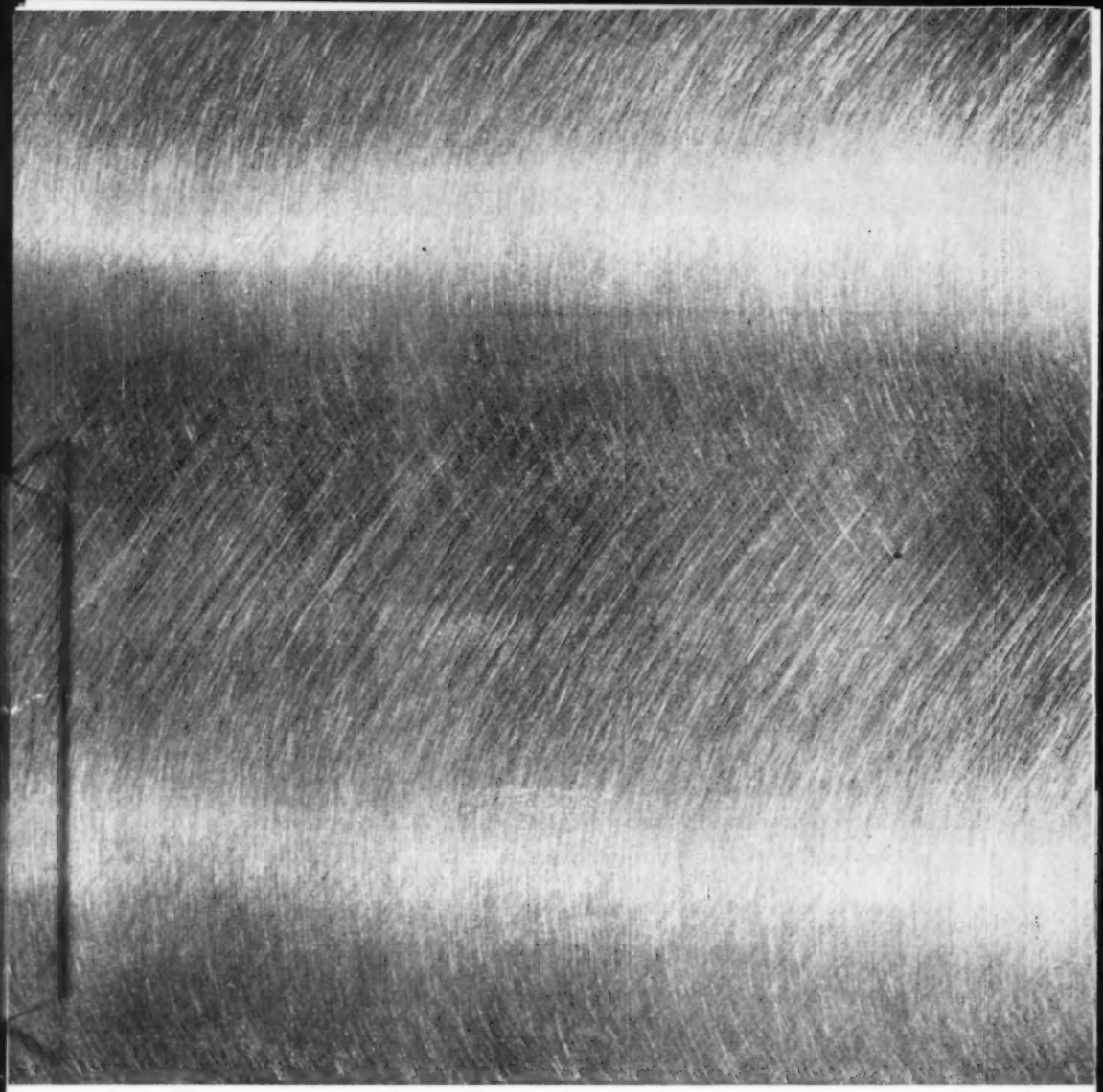
THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.



SUPERFINISH STARTS - OR STOPS - AT SCRATCH!

Perhaps you've thought of Superfinish only in terms of ultra-smooth surfaces. Not always! Here's one where the process has been stopped—controlled at a surface roughness of 10 micro inches. Note, in this magnification, how the abrasive grits have moved in paths which never duplicate, leaving a crosshatch pattern. For certain applications, such partially Superfinished surfaces have two distinct advantages: (1) removal of the soft "smear metal" left by grinding heat, (2) the crosshatch pattern maintains uniform distribution of lubricant to discourage spalling.

Superfinish has many other interesting applications. Write on your letterhead for the booklet, "Wear and Surface Finish."

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUNDTABLE
represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcome here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

no other milling cutter will outperform a UNION

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under the heading "Drills, Twist".

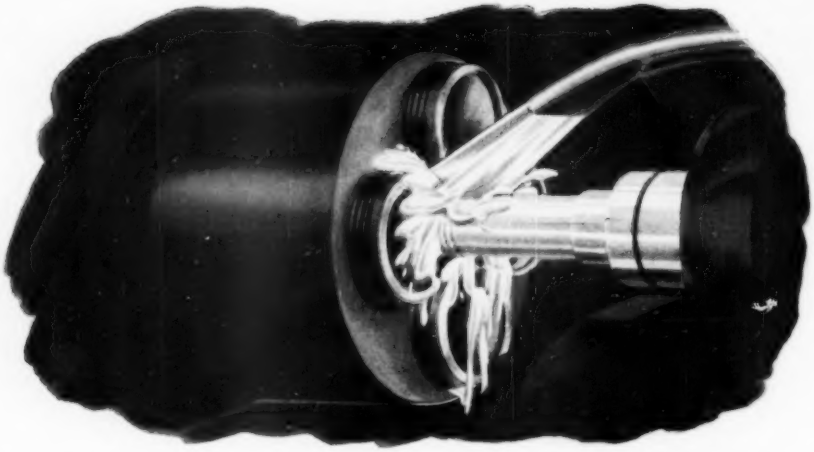
UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.



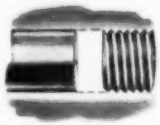
THREADING AND TAPPING ALCOA ALUMINUM in Screw Machines

You save stock and machine time by following the simple procedures for threading and tapping Alcoa Aluminum Screw Machine Stock.

Seizing tendencies will be minimized if the threads are smoothly cut. Where possible, use a die head with adjustable chasers rather than a solid die. Spiral taps are preferred to straight fluted taps, especially for deep-hole tapping operations.

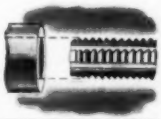
Two sections of the free booklet "Alcoa Aluminum in Automatic Screw Machines" are devoted to threading and tapping. The entire book is packed with technical information gained from Alcoa's 60 years of aluminum experience. Ask for your copy at your nearby Alcoa sales office or write ALUMINUM COMPANY OF AMERICA, 1709 Gulf Bldg., Pittsburgh 19, Pa.

GOOD MACHINING PRACTICES SAVE METAL



METAL REMOVAL—Both dies and taps remove large amounts of metal in proportion to their size. To reduce the load, have the blank or hole diameter of the part to be threaded near the tolerance limit favoring the removal of the least metal.

ALIGNMENT—Taps and dies must be accurately aligned with the part to be threaded. This is extremely important if threads are to be true.



TOP RAKE ANGLES—Both taps and dies for aluminum work should have a top rake angle ground on the leading edge of the tool. Tap flutes should be highly polished. The backs of tap lands should have little or no top rake to prevent shaving the threads as the tap is removed.

LIP HOOKS—Dies and taps will cut the softer alloys better if a hook is ground along the leading edge of the lands to the third full thread, at about 5° to the axis of the tap or chaser. This provides more rake at the initial cutting edge.

ALCOA FIRST IN ALUMINUM

Shield Brand Tools

STANDARD TOOL CO.

FOREMOST QUALITY...

IN DESIGN

Most efficient designs—not theoretical but based on *success* in solving tough drilling, reaming, tapping and machining problems for industry since 1881.

IN MATERIAL

Standard's specifications for material are recognized by producers of tool steel as the most rigid in the perishable tool industry.

IN WORKMANSHIP

Craftsmanship that wins the critical approval of skilled tool and die makers in our customer organizations. Maintained by a series of exacting inspections and scientific tests.

QUALITY PROVED PERFORMANCE

Standard Shield Brand Tools are regularly specified and used in the following mass production industries — Automotive — Aviation — Electrical Equipment — Household Appliance — Farm Implement —Railroad.

Specify Standard Foremost Quality for low-cost production. Sold by leading Mill Supply Distributors, coast to coast.

STANDARD TOOL CO.

Successor to The Standard Tool Company

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Warehouses: New York · Detroit · Chicago

THE STANDARD LINE · Drills · Reamers · Taps · Dies · Milling Cutters · Special Tools

STANDARDIZE!

it pays

because it saves

THE Shield Brand line of *Foremost Quality* tools is complete. Therefore we can supply your requirements for all classes of perishable tools.

By thus Standardizing your requirements you can make at least 6 savings:

1. **Time saved in Requisitioning**
2. **Time saved in Purchasing**
3. **Time saved in Stock Keeping**
4. **Time saved in the Tool Crib**
5. **Time saved in tool maintenance**
6. **Production gained in the Machine Shop**

Service on Shield Brand Tools is prompt, assured by our large stock of over 10,000 items and nation-wide distribution by Leading Mill Supply Distributors. Call your distributor or write,

STANDARD TOOL CO.

Successor to The Standard Tool Company

CLEVELAND, OHIO

Warehouses: New York · Detroit · Chicago

eliminate secondary operations

Excessive rehandling costs can force you out of a market—no one knows that better than your vice president in charge of manufacturing.

He knows, too, that the one best way to reduce part costs is to do more operations before the work leaves the automatics. But does he know that the most recent developments in tooling the new Acme-Gridley automatics often eliminate not only one but two and three rehandlings?

A few pertinent case studies showing how other manufacturers have cut their piece costs substantially—by reducing handling time, machine overhead and floor space—may remind him what the new Acme-Gridleys can do for you. Here's a typical example; we'll gladly give you more. No obligation, of course.

CUT THIS OUT FOR USE WHEN YOUR VICE PRESIDENT WANTS PROOF

AN ACME-GRIDLEY CERTIFIED CASE STUDY

THIS IS WHAT HAPPENED:

PART TURNED—Bicycle Pedal Shaft

SIZE—$\frac{3}{4}$" dia. x $4\frac{5}{8}$"

MATERIAL—B-1112 Steel

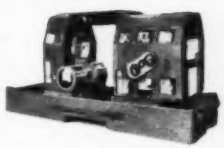
MACHINE—$1\frac{1}{4}$" RA 6 Spindle Acme-Gridley Bar Automatic

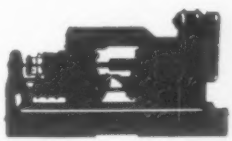
OPERATIONS—13, including shave large thread diameter, and roll thread, mill flats or large diameter, die cut thread and mill keyway on small end

MACHINING TIME—15 seconds, complete

AND HERE'S ONE IMPORTANT REASON:

The rigid, box-type, balanced frame of an Acme-Gridley Automatic resists vibration, *holds* precision on heavy cuts, and provides ample room for many independently operated power-driven auxiliaries. Construction is strong throughout, from the heavily-ribbed pan to the rigid one-piece top brace. Gear-box and headstock are cross-walled, with reinforced shaft bosses. All fitted frame surfaces are ground, aligned, bolted and doweled, to form a sturdy, vibration-resisting foundation that permits accurate, high-speed operation.





THE NATIONAL ACME COMPANY

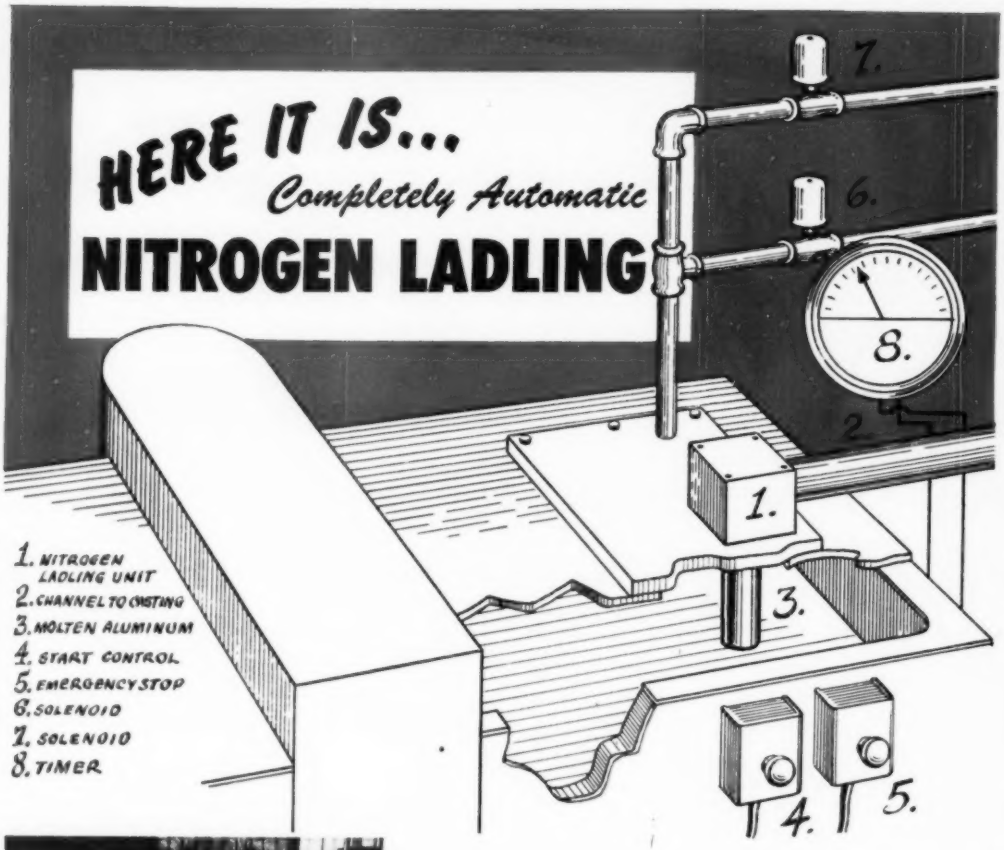
170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8-spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

HERE IT IS...

Completely Automatic

NITROGEN LADLING



HAND LADLING *is Obsolete!*

Lindberg-Fisher announces a revolutionary development in handling molten aluminum—completely automatic nitrogen ladling.

Now . . . for the first time, mass production techniques can be applied to your casting production. Here are some of the many advantages available with Lindberg-Fisher Nitrogen Ladling:

- ★ Increased production.
- ★ Precise, mechanically controlled casting shots.
- ★ Lowest possible casting temperatures, electronically controlled.
- ★ Longer die life because of lower casting temperatures.
- ★ Safer operation with mechanically handled hot metal.
- ★ Reduced casting rejects from fatigue, human errors, etc.
- ★ Atmosphere protected molten alloy.
- ★ Reduced metal losses.
- ★ Greatly improved working conditions.

For the story of nitrogen ladling, call your Lindberg-Fisher representative or write Lindberg Engineering Company

LINDBERG-Fisher MELTING FURNACES

A DIVISION OF LINDBERG ENGINEERING COMPANY
2445 West Hubbard Street, Chicago 12, Illinois

By Popular Demand . . .

. . . a CERAMIC Surface Plate

THE demand throughout industry for a flatter, smoother, more wear-resistant surface plate prompted Norton Company to develop the first *ceramic* surface plate to be marketed. Made by specialists in wear-resistant materials and precision surface finishes, the Norton Ceramic Surface Plate has six important qualities

1. longer life
2. flatter surface
3. smoother surface
4. non-corrosive
5. ideal for blueing
6. non-magnetic

Made of one of the hardest materials known, these plates show to the best advantage in severe production gaging and blueing operations. The precise flatness combined with the unusual smoothness of this ceramic surface plate shortens the time required to take readings on an indicator; and it prevents wear of expensive gage blocks, instrument bases and sine bars.

The Norton Ceramic Surface Plate is guaranteed to be flat within .0001", and it *stays flat*. It will not warp or deform, will not sweat or corrode, will not deflect under load, will not give expansion troubles. It is non-magnetic.

For more information on the longest-wearing, precision surface plates ever made—write: Norton Company, Worcester 6, Mass., for our free Bulletin No. 1174.

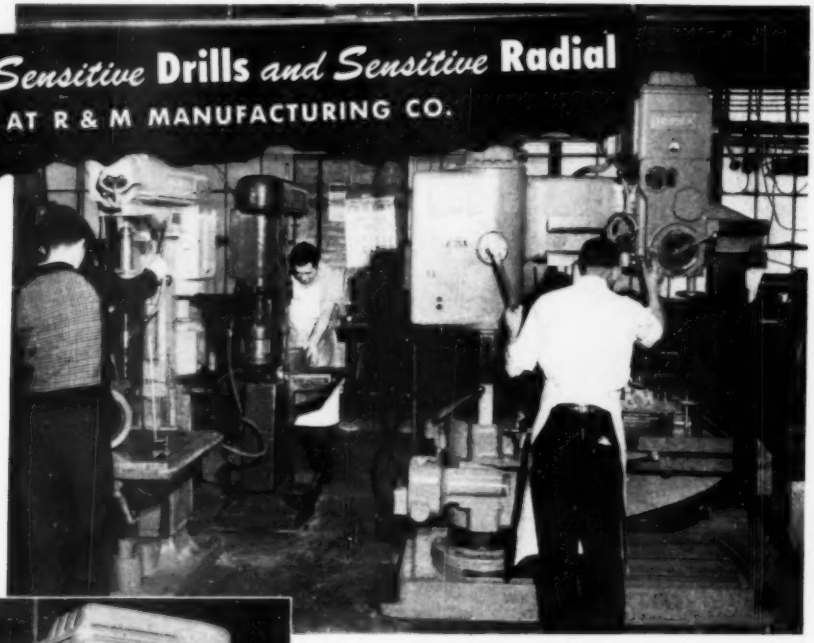
NORTON COMPANY
Worcester 6, Massachusetts

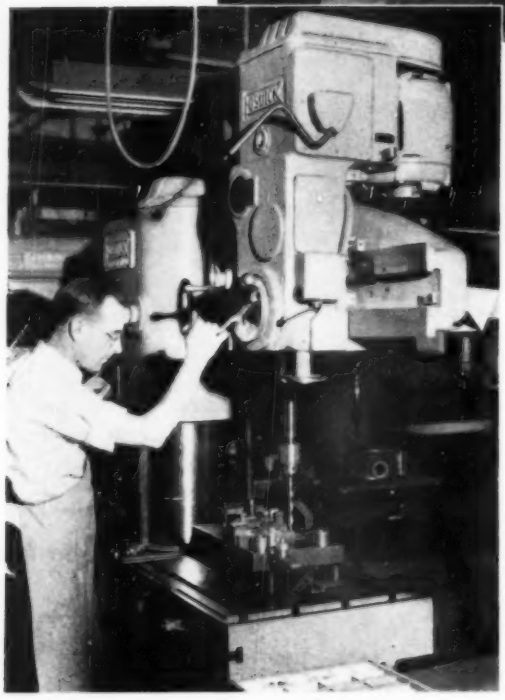
NORTON®

CERAMIC SURFACE PLATES

FOSDICK *Sensitive* Drills *and Sensitive* Radial

AT R & M MANUFACTURING CO.





• The shop scene above is typical of hundreds of plants now using Fosdick Sensitive Drills and the many that have installed Sensitive Radials.

The original Fosdick Sensitive Radial has filled the need for a high speed sensitive type drill with the utility features common to radial design and construction combined in one machine.

The rigidity of this machine for sensitive production—the nine speeds and four feeds—the centralized location of controls on the head—the adjustable table and the arm at fixed height both of which swing in an arc of 360 , are but a few of the features that are responsible for its quick, general acceptance by manufacturers from coast to coast.

Full details available in the new Fosdick Sensitive Radial Bulletin, S.R.A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

NEWTON
Hydraulic Feed
COLD SAW MACHINES

Their savings mean lower operating costs to you

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

For full information write for Bulletin No. 537

NEWTON Hydraulic Cold Saw Machines are built in a range of designs of proved adaptability to handling all types of work in either ferrous or non-ferrous metals. Built in sizes to accommodate blades from 32″ to 120″ diameter.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

NOW... Eliminate guesswork in lathe calculations....

...with this EXCLUSIVE CALCULATOR—on all Lodge & Shipley Model "X" Lathes

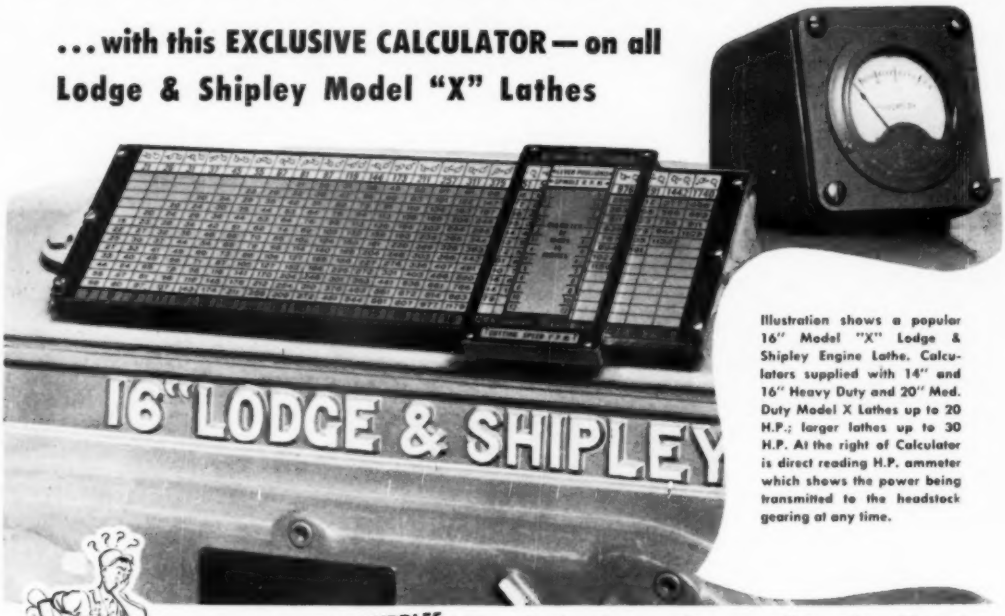


Illustration shows a popular 16" Model "X" Lodge & Shipley Engine Lathe. Calculators supplied with 14" and 16" Heavy Duty and 20" Med. Duty Model X Lathes up to 20 H.P.; larger lathes up to 30 H.P. At the right of Calculator is direct reading H.P. ammeter which shows the power being transmitted to the headstock gearing at any time.

BANISHES MENTAL MUDDLES . . .

SLIPSTICK STRUGGLES . . .

PENCIL PUZZLIN' . . .

ANOTHER exclusive feature to save time, increase efficiency is introduced by Lodge & Shipley. Now you merely set the feet-per-minute cutting speed on the Calculator against the largest diameter of the workpiece and read off the proper R.P.M. and correct lever settings. The maximum H.P. for this speed also appears at the bottom of the Calculator.

There are no mental gymnastics on the part of the operator, no waiting for a set-up man, no errors . . . the calculating operation is quick and entirely mechanical.

The direct reading H.P. ammeter (optional at extra cost) indicates the H.P. being supplied to the headstock at any time or condition of cut. Motor is protected against overloading. In the high speed range, the L & S headstock will transmit maximum H.P. for about 80% of that range.

With this exclusive Lodge & Shipley feature, even unskilled operators can sustain maximum productivity . . . feel confident in changing speeds so easily determined . . . perform *more work* at the *most economical speed.* Thus the newly-introduced Lodge & Shipley "X" Lathes, already setting new standards for production and profit, reach even greater efficiency. Your Lodge & Shipley Representative will gladly furnish complete details.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Another* Lodge & Shipley *Profit Feature!

Sebastian
GEARED HEAD
LATHES
by KING

..."For Many Jobs Formerly Done On Much More Expensive Equipment"

New 16" Sebastian Lathe recently installed at the D. O. James Gear Mfg. Co., Chicago. Sebastian Geared-Head General Purpose Lathes are also made in 12" and 20" sizes.

D.O. JAMES
Manufacturers of Gear Manufacturing Co.
SPUR HELICAL TRANSMISSION - WORM GEAR - RACKS - SPECIAL GEARS

CHICAGO 7, ILL. U.S.A.
January 27, 1949.

Mr. S. L. Beckwith, Sales Manager
American Steel Foundries
Tennessee Avenue & Paddock Road.,
Cincinnati 29, Ohio

Dear Mr. Beckwith:

We appreciate your interest, following the delivery of our new Sebastian Lathe, in frankly asking us what we think of this lathe.

We have many lathes in operation and have always considered that we must have nothing but the heavy duty type lathe as a matter of policy.

Since the delivery and installation of our new 16" x 6' Sebastian, we have found that so many jobs can be done on it that we find ourselves thinking in terms of this lathe for many jobs formerly done on much heavier and much more expensive equipment.

For facing shoulders on hubs, turning a face angle or back angle we find this Sebastian lathe more than adequate and because of its sturdy construction it is capable of much work up to its rated capacity.

We are giving serious consideration to additional installations because of the satisfactory operation of this first one.

Very truly yours,
D. O. JAMES GEAR MFG. COMPANY
By John B. Lukey
John B. Lukey,
General Superintendent.

JBL:SS

Like the D. O. James Gear Manufacturing Company and other prominent, cost-alert manufacturers, you will get the accuracy, versatility, and dependable performance of *larger, more expensive lathes* when you specify the medium-priced "King-made" Sebastian.

With 8 speed steel-geared head . . . Timken Tapered Bearings on all headstock shafts . . . Reverse in apron for feeds . . . 57 feed and thread changes . . . and many other outstanding features . . . the modern Sebastian definitely offers *more lathe for your money.*

See your nearest Sebastian Dealer. Ask him or write us for Catalog S-1 (Standard Lathes) and S-101 (Special Type Lathes — Gap, Clutch and Brake, etc.)

Dealers in Principal Industrial Centers

American Steel Foundries

KING MACHINE TOOL DIVISION
CINCINNATI 29, OHIO
Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

REAL HELP for you...

Cuts Costs on
CONTOUR . . . PROFILE . . .
CURVED OR CUT-OFF SAWING
of non-ferrous metals, plastics or wood

Atkins Curled-Chip Band Saws are made in widths from ¼" to 1"; 2, 3, 4 and 6 teeth per inch, depending upon width.

Curled-Chip ATKINS Band Saws

Less Refinishing — with Higher Cutting Speeds and Heavier Feeds

Atkins Curled-Chip Band Saws were created to meet the need for consistently heavier feeds at higher saw speeds on all non-ferrous metals, plastics or wood.

The inward-curved cutting face of the Curled-Chip tooth lifts the chip with a continuous, curling action. Back pressure, excessive heat and work spoilage are minimized. The greater gullet capacity of the Atkins-originated "Skip-Tooth" buttress-type band saw provides quicker removal of chips, prevents clogging. The result is a band that cuts freer and faster, *and stays on the job longer* — that gives cleaner cuts, leaves fewer burrs and minimizes refinishing. All of which adds up to lower cost cutting for you...Better order the Atkins Curled-Chip Bands you're going to need from your Industrial Distributor right now.

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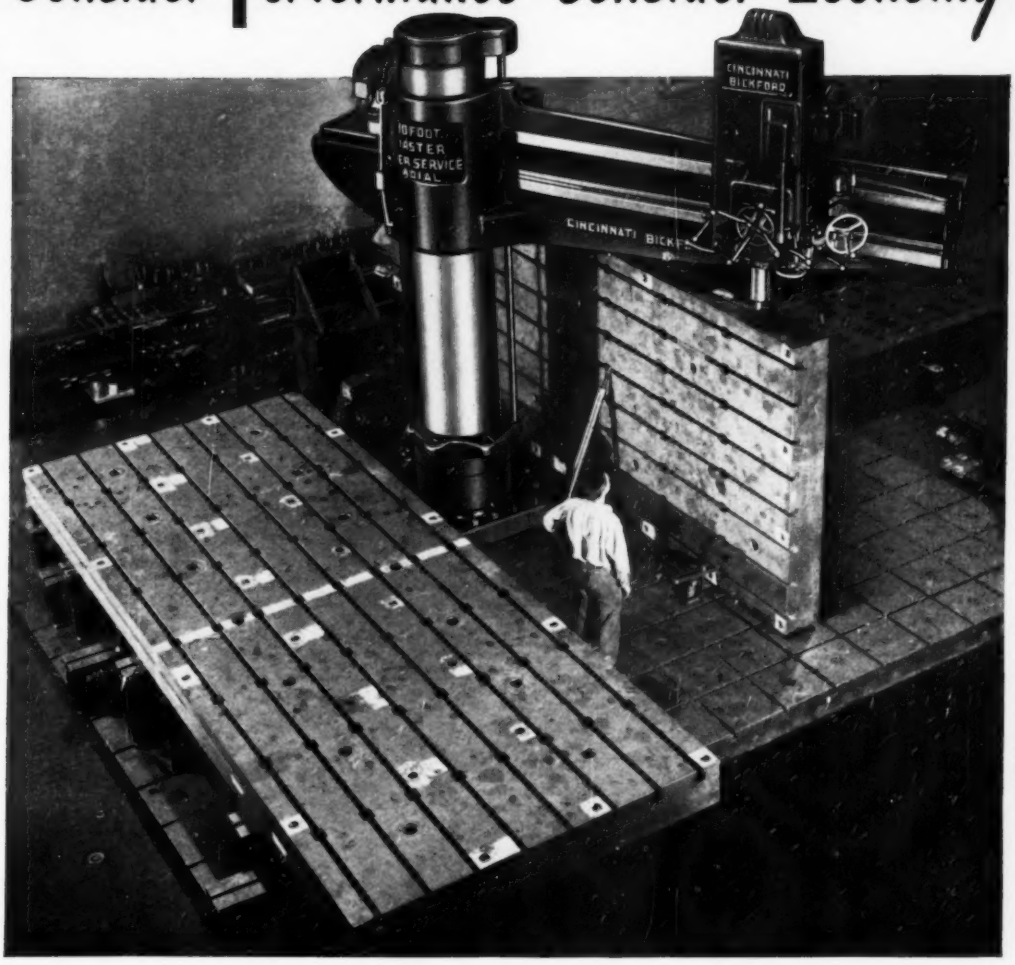
MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

Consider Performance-Consider Economy



Power and the rigidity to apply that power accurately are found in the Cincinnati Bickford Master Super Service Radial.

Long maintenance-free, low-cost operation under severe conditions is assured.

Finely balanced, with easily manipulated, convenient controls, these machines bring operator ease and a smooth, rapid performance.

The rigid Super Service column and arm construction give accurate drilling on the tallest jobs.

- Write for Circular R-22—and check the many features of the Cincinnati Bickford Master Super Service Radials.

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RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES
Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
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Nation-wide die set assembly service, pioneered and perfected by Danly, is today a highly specialized business offering the stamping industry a fast, efficient means of obtaining deliveries on short notices. Because there are several Danly types and several thousand interchangeable combinations, a simple catalog selection is all that is usually required to suit specific needs.

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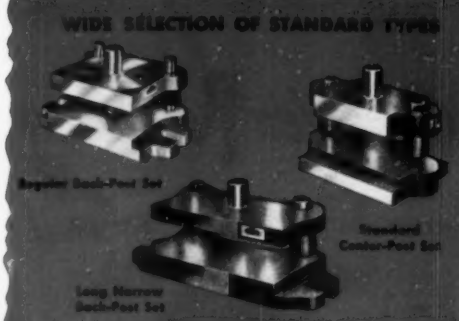

Accuracy is highly important. Modern precision gauging methods are employed.

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These Danly branches are in position to give you efficient service. Assembly plants listed below (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to suit specifications.

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- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
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PRECISION DIE SETS . . . STANDARD AND SPECIAL

SPOT NEWS OF METALWORKING

New process of plating bumpers is being tried by an automobile company. Flat sheet steel bumper stock is polished and then formed, after which it is plated, final buffing being eliminated.

Italian-built machine tools are reported making notable headway in Argentina. Machines are shipped to Argentina and warehoused. Sample of each type is put on floor and demonstrated by skilled operator to prospective customers. If Italians can't get cash, they take credit up to six months. Little money changes hands between two countries. Italians get wheat and beef for machine tools.

Hydraulic steering gear servos are reputed in Detroit to be one of the new important developments in the larger cars. They are thought desirable because it is so difficult for a woman to park one of the new big cars with the wide-tread super-cushion tires. If steering gear ratio is low enough to make it easy, it is unsafe at high speeds. Bendix holds patents for hydraulic gears made by Saginaw Division of General Motors and Ross Gear Co.

Impact extrusion of magnesium seems likely soon. First application probably will be to replace zinc as anode (case) in dry cells. Extruded case is made at elevated temperature.

Order for 14,000 looms recently received by New England firm, is believed to be largest single order ever placed for textile machinery.

Austria is now turning out an average of 320,000 bearings monthly, almost five times the 1937 (pre-anschluss) rate.

Complete retooling job for 1950 models, including new engine, is planned by one of the divisions of the automotive Big Three, according to reliable Detroit reports. It will be the first major engine revamping for this division since the 1930's.

Janmat will die on June 30. From then on, Munitions Board will do the policy work on stockpiling, Navy will do the leg work pending assignment of Janmat's operations to a specific government department. Janmat's field personnel will be returned to their original jobs. This, in effect, puts an end to Janmat's field activities.

Crushed-form grinding may supersede shaving of stamped hardware parts to get a good working surface on edge contour. An automatic machine has been developed for this purpose. It will grind 4000 pieces per hr. to an accuracy of a few tenths and will give a completely good working surface.

Substantial sales of better-quality capital goods "from the floor" have been made at the exhibit of industrial products of western Germany at Rockefeller Center in New York City. Goods are reported competitive in price with similar U.S.-made items.

Wages in machinery manufacturing plants are generally higher in Great Lakes and Pacific Coast cities, BLS survey shows. Earnings were highest in some jobs in Houston, Pittsburgh, Syracuse. Lowest wages were found in Atlanta, Dallas, Cincinnati. Some average wages: tool and die makers, $1.51 - $2.13 an hour; production machinists, $1.38 - $1.81, the same range applying to Class A assemblers, engine-lathe operators, inspectors, hand welders.

Gaging Metalworking

A general lowering of prices in many metalworking lines was the outstanding development of the last fortnight.

► Non-ferrous metals, from copper right on through most of the commodities, showed increasing softness. Steel extras are in the process of being revised downward or eliminated. And basic prices of some steel items have been cut.

► Among end commodities, price declines have been extensive. Diesel-electric locomotives, for example, are down about 5% as a result of action first taken by General Motors and later by Fairbanks-Morse and American Locomotive. One company has reduced oil burners 7% to 12%. A number of household appliances have been repriced on a lower level.

Prices Cut to Aid Demand

All of these price concessions reflect decision on the part of manufacturers to pass along production economies and materials—cost savings to the user and, in many cases, to stimulate a lagging demand.

Makers of numerous metal products have been faced with a vital problem: whether to continue to produce goods longer at a rate greatly in excess of the inflow of orders. Inventories are accumulating; and this situation cannot go on indefinitely.

► The desire of manufacturers to pare stocks of raw materials, semi-finished parts and processed goods is cutting severely into the business of suppliers. Cutting tool makers happen to be one sample. They have been feeling the pinch as customers draw upon inventories instead of ordering new stock from the factories.

Auto Output at All-Time Peak

As an offset to these unfavorable developments, seasonal forces are being felt in various segments of metalworking. Perhaps the most spectacular example is the automobile industry. It is now building cars at an annual rate of six million units, an almost unheard of pace. The spring upturn in sales has been even bigger than anticiptaed.

► The effect of the automotive spurt is to give needed support to many metalworking suppliers who otherwise would be scratching hard for business. At least two General Motors car divisions are doing so well that they have notified suppliers to keep shipping parts at the present volume during all of 1949.

Whether this burst of enthusiasm is justified remains to be seen. At any rate, it now appears that car production in the third quarter as well as in the second quarter will be very high. A 5-million-unit year seems reasonably sure for the industry, though much will depend upon what happens in the year's final quarter.

Main shadow hanging over the industry is threatened and existing labor disturbances, particularly at Ford. It is too early to judge whether strikes may interfere seriously with car production in the next 60 days. A walkout at Packard was settled four hours after it started.

Farm Implement People Busy

In farm implements as well as in automobiles, order books still are bulging. Manufacturers of all kinds of agricultural units have good schedules ahead and now are operating at or near full capacity. But deliveries are getting shorter as output exceeds fresh sales. Makers of tractors and earth-moving equipment promise to run at a peak rate for many months.

In the railroad equipment industry, too, operations are at a high level. New capacity is just coming in so far as diesel-electric locomotives are concerned. This capacity will be fully engaged for a long time ahead. But orders for freight cars have dropped off.

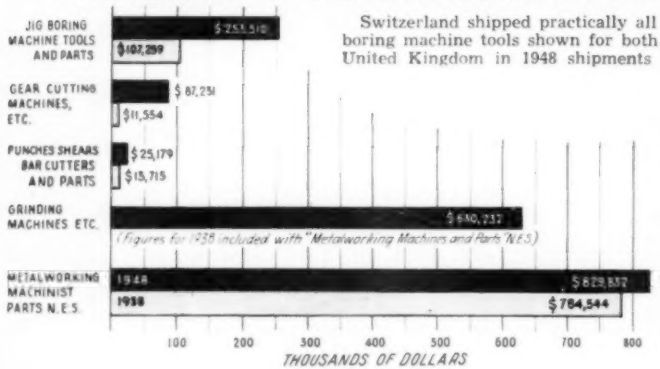
Machine Tool Orders Gain

Machine tool orders took an encouraging turn in March. They suddenly climbed to the highest point since the middle of 1946. They stood at 93.1 on the index of the National Machine Tool Builders' Association, with average shipments during 1945-1947 taken as 100.

► Foreign bookings comprised 22.3% of the total, down a bit from the February ratio of 26.5%, but substantially better than the prevailing rate in 1948. With ECA financing as a stimulus, there is reason to believe that export orders placed with U.S. builders this year may touch the $90 million mark. Before the war, the machine tool industry sold about one-fifth of its output abroad.

► Machine tool production rose in

U.S. IMPORTS OF METALWORKING MACHINERY, 1938 and 1948

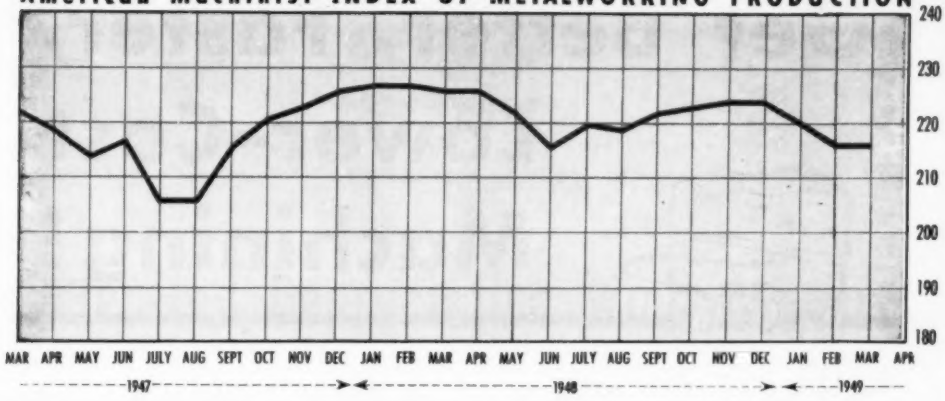


Switzerland shipped practically all of the gear cutting machines and jig boring machine tools shown for both 1938 and 1948, and led Belgium and United Kingdom in 1948 shipments of punches, shears, and bar cutters. Germany led in that category in 1938.

In grinding machines Sweden ($246,791); Switzerland ($189,827); U. K. ($104,044); Germany ($39,765); and Canada ($27,231) were biggest 1948 suppliers.

In the columns for other metalworking machinery, 1948 leaders were Switzerland ($305,049); Canada ($251,872); U. K. ($184,628). In 1938 Germany with $358,452 and Switzerland with $184,360 led. Of course, the 1938 figures also include grinding machines, listed separately for 1948. (Data: Dept. of Commerce.)

American Machinist INDEX OF METALWORKING PRODUCTION



INDEX	COMPONENTS					
	MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING	
Mar. 1949 (preliminary)	216	234	212	227	302	148
Feb. 1949 (revised) ..	219	239	224	227	304	150
Mar. 1948	226	251	238	234	289	156

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 23.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

March to 75.3 on the NMTBA index, compared with 70.3 the previous month. Ratio of unfilled orders to shipments currently is 4.4 to 1.

Standard Tool Builders Hit

Hope for a further pick-up in machine tool buying centers around the need for retooling for many domestic industries, as well as around export business. The trouble now is that too many customers are holding back to see what will happen in tax and labor legislation. Some buyers are saying that they will not place more orders until after June 1.

► Makers of standard, general-purpose machine tools continue to be harder hit than those selling specials or semi-specials. A number of builders are running on a 32-hr. week to spread the work. A few companies, with big current orders which must be filled within a brief time limit, are operating certain departments as high as 60 hr. a week. But that is the exception rather than the rule.

Steel Easier to Get

The materials situation is easing all round. Some categories of steel, more especially sheet and strip, are tight, but not to the extent that they were. Conversion deals are about to become a thing of the past, except for completion of contracts entered into some time ago. There is evidence that users are beginning to stock up a bit on steel items, though they are watching carefully their inventories. Scrap is more plentiful and prices of scrap have come far down from the peak.

Copper, like steel, is less a worry than it was. Output still does not leave a margin of safety; but production is catching up faster now. Lead and zinc are in much better supply.

Gray Iron Foundries Doing Well

Gray iron foundries are reported operating around 70% of capacity, with captive foundries a little above that rate. Demand continues good, but orders placed are on a short-time basis only. Customers are hoping for price concessions in the next few months. Present backlog for the industry is about two months. Mortality rate is high for war-born foundries and for those which have not mechanized.

Metalworking Output Down

American Machinist index of metalworking production for March dropped three points to 216 from the revised February figure of 219. This time last year it was 226. (1939 equals 100.)

Greatest decline was in electrical manufacturing—212 against 224 in February, a partial reflection of the lessened demand for electrical appliances. There was no change in the auto industry, after the 11-point drop reported two weeks ago.

Except for a 5-point decline in industrial machinery, there were no important changes in the other components of metalworking production.

Drop Forge People Busy

Drop forge companies report a good demand, but customers are exerting pressure for price reductions. Automobile manufacturers are putting on the most heat. Backlogs are sufficient to insure comfortable operations during the next several months.

► Bar stock is easier to get, say drop forgers. In fact, bar steel makers are showing keen interest again in securing a share of the forging industry's business. There is some softening by a few steel makers who are eliminating certain charges for extras.

Tool and Die Shops Need Orders

Tool and die shops are running close to the same pace as a year ago. Most of them have slim back logs and are seriously in need of orders. It is believed that April may have shown some improvement, though it is too early to get accurate figures for the industry as a whole.

► The cutting tool people are not doing as well as they did a few months ago, but their volume still is excellent by prewar standards.

Get Better, Faster, Lower-Cost Machining!

A Texaco Lubrication Engineer will help you get *Results Like These*...

CUTTER COST HALVED

Two high-speed Fellows Gear Shapers were used for cutting automotive transmission gears, 8-10 pitch, 14 and 19 teeth. Here, Texaco Sulfex Cutting Oil increased the number of gears cut, before scrapping cutter, from 504 to 1017.

225% GREATER TAPPING OUTPUT

On an 8-spindle vertical tapping machine, using ¾" and 1" high-speed pipe taps on ¾" free machining pipe tubing, Texaco Soluble Oil Heavy Duty increased production 2¼ times, with fewer tool grinds and only one extra piece of scrap.

50% LONGER BROACH LIFE

The job was cutting internal splines, 3/16" to ¼" in depth, 24 to 30 splines per piece. Pieces were 6" long and 2" in diameter, of S.A.E. 4640 steel, 310-330 Brinell hardness. A change to Texaco Sulfex Cutting Oil, as recommended by the Texaco Lubrication Engineer, immediately increased broach life 50% and eliminated sizing difficulties.

THE examples cited are typical of the job Texaco is doing on *all* types of machining operations. Whatever the metal or your method of machining it, there is a *Texaco Cutting, Soluble or Grinding Oil* to help you increase production and turn out better work at lower cost.

A Texaco Lubrication Engineer with wide, practical, metal working experience, will gladly study your particular machining jobs and make specific recommendations for cutting coolants.

Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Tune in . . . TEXACO STAR THEATRE every Wednesday night starring Milton Berle. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Accelerated Depreciation Wins Converts

Two events, one in London and the other in Washington, give encouragement to the belief that accelerated depreciation is winning important converts.

No other than the Labor government in Britain has cast its vote for it. In an effort to get British manufacturers to install new cost-cutting machinery, it has decided to permit high write-offs for tax purposes in the first years of ownership.

That action follows the precedent set by Germany in the 1930's and by Canada in the early postwar years.

Everyone knows that productivity in British industry has not been what it should be. Too little new equipment has replaced archaic and obsolete machines. Hence the recognition by government that something must be done; and the inducement offered in the form of an accelerated rate of depreciation more in keeping with the useful life of production equipment.

The second event of considerable moment is the recent report of a subcommittee of the United States Senate's Interstate Commerce Committee. The report pertained to Textron Corporation and the current and potential situation in the textile industry. It dealt, in part, with depreciation rates on textile machinery.

The committee recommended giving manufacturers the option of charging off 20% of the cost of new machinery each year for five years, provided the new machinery is used to replace old equipment.

Referring to the Treasury Department's "unrealistic view" of the usable life of machinery —25 years for spinning and weaving machines, 15 years for knitting machines—the committee report said:

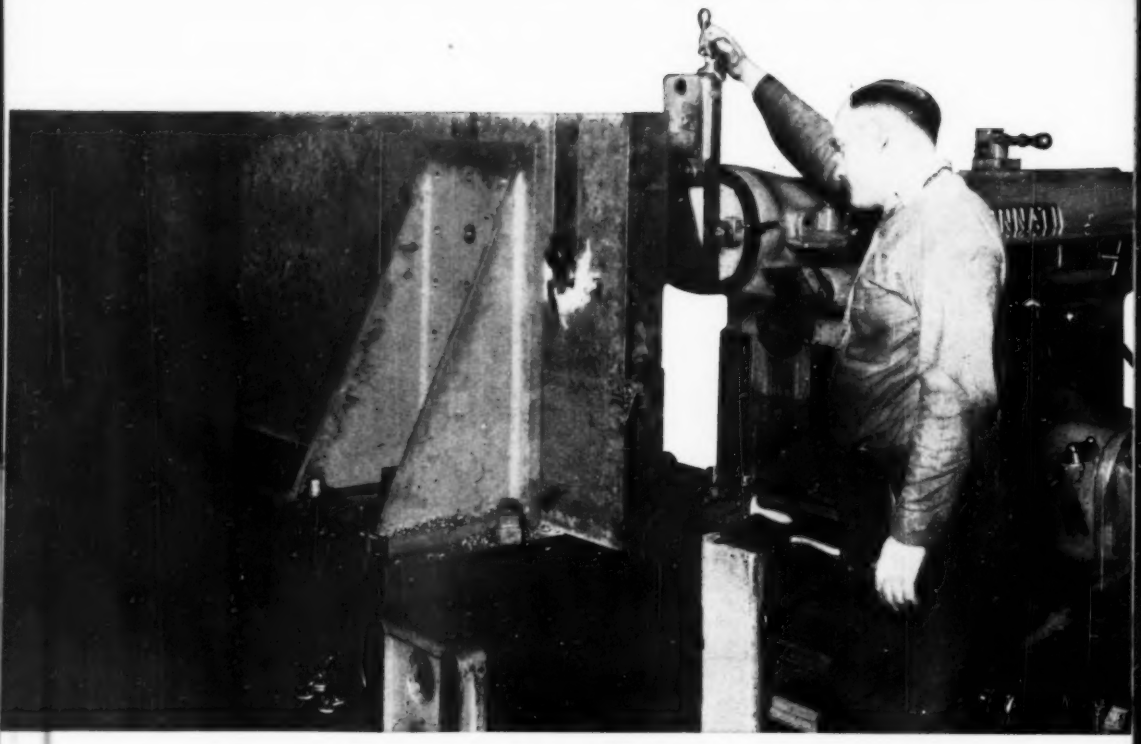
"This entirely overlooks the fact that the usable life of machinery in this modern age is limited by new technological developments which may may make it obsolescent far sooner than any of the periods just stated."

What applies to textile machinery applies equally to machine tools and all other kinds of metalworking equipment. The obsolescence factor should be given adequate recognition in establishing depreciation rates.

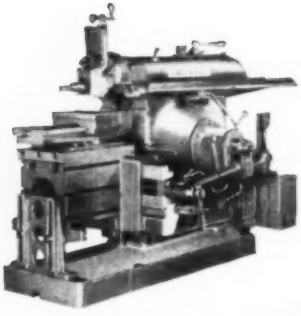
These two happenings, the British shift in depreciation policy and the recommendation of the Senate subcommittee, give hope that the time is not far distant when Congress as a whole will give its ear to the merits of accelerated write-offs on new machinery.

Burnham Finney

EDITOR



Shaping a BIG job...



Internal shaping bearing seats in this 5500-lb. steel plate to a tolerance of .001 indicates the accuracy and rigidity of Cincinnati Shapers.

The rapid and accurate metal removal, and the low-cost setup for shaping this 12' steel plate on the sturdy Cincinnati table, give low-cost operation.

The unusual flexibility of change from job to job in minimum time and with minimum costs of tooling and fixtures also has made the Cincinnati Shaper the handy man of industry.

A versatile Cincinnati Shaper will be a busy and profitable machine in your shop.

Write for Catalog N-5 for detailed description of the types and sizes of Cincinnati Shapers.

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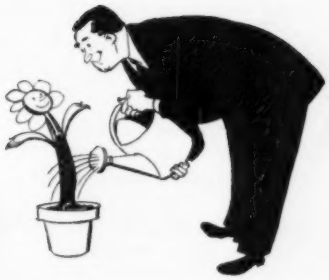


TRAIN YOUR FOREMAN IN HUMAN RELATIONS

BY VICTOR I. BUMAGIN Editor and Director of Foremen Training, Labor Relations Institute, New York

Employee attitude toward the company may depend upon how well foremen handle scores of human problems daily

GETTING along with people is just about the toughest job in the world.

And like all tough jobs, it requires thorough and extensive training. It is not an ability that people have at birth, but rather one they acquire through association and experience. And because foremen are people, just like everyone else, they too must be trained in this field.

Unfortunately, the foreman is all too often "the forgotten man" in management training plans. He is the "X" factor—the "unknown"—that crops up at the most inopportune times, and in the most embarrassing places.

To illustrate: Fine policies for good human relations are often mapped at the highest levels of management to assure a stable working force of high morale. Yet, the foreman, whose job it is to carry out these policies, is often not properly instructed on how to do so.

Later, when the question arises, "Why, haven't our policies been carried out?", the answer is, "Because the foreman, who is really the only man for the job, doesn't know how."

This lack of foreman training or "know-how" is often reflected in a worker's attitude toward the company, because his attitude indicates how well the supervisor is doing his job. This is particularly true in the large metalworking plant, where the owner or manager cannot hope to maintain close contact with the individual worker.

What foremen must do

Human relations, as a phrase, has acquired wide use in recent years. But, too often, not enough attention is directed to its practical application.

As applied to foremen, human relations is the art of dealing with people. Basically, this is a "selling" job and "selling" an individual worker is largely a matter of knowing what appeals to him most. Trouble is, Worker Jones is different from Worker Smith—and what may appeal to Jones may not cut any ice with Smith. However, there are "salesmanship" principles available that can be counted on to hit most workers when there is any selling being done.

The average human being is interested in the following things:

Himself: his name, self importance, personal ambitions, things he has done well and can do well.

Life's basics: for example, his security, pay check, health, working conditions.

Other people (in this order): immediate family, relatives, friends, acquaintances, people he has seen, those he has heard about.

Anything close to the field in which he is active.

Hobbies: things he enjoys doing.

Any combination of as many of these as possible insures success. Once foremen have grasped this fact, they can't help but win.

Why train foremen

Facility is applying these ideas to daily work is not easily developed. Long training is required before the foreman acquires the flexibility to deal with workers as individuals. Every day he has countless contacts with the worker. He must learn to "do a job" on each of these widely varying contacts.

Elements of the foreman's job that cry for human relations attention are listed separately. Some of these points are concerned almost entirely with human relations techniques. Others are more specifically geared to technical subjects, closely allied with production. But common to all is the need for a certain amount of human relations knowledge. One thing is certain:

"The average human being is interested in certain things . . ."

a proper human relations approach in these areas cannot hurt and should be of great help.

How programs are set up

An effective foreman training program, in which human relations instruction forms an important part, depends upon competent personnel. Their duties and policies should be defined by management. In small companies, the training director, who heads the program, may be the personnel director or plant owner. But in a large company, the training director generally works under the personnel director.

Duties of the training director in small and moderate-sized companies include these:

1. List training needs.
2. Select and train instructors.
3. Supervise the preparation of instructional material, including visual aids, manuals, check lists, charts, lectures, and films.
4. Keep abreast of public and private agencies that are equipped to render training services.
5. Direct all training and maintain follow-up records of training progress.

Details of programs vary widely from plant to plant. One company has a manual for training conference leaders. Another develops different kinds of training material for each conference—one type for trainees, the other for instructors.

In some cases, training sessions are held on a fixed day each month, at a predetermined hour; in others, companies avoid fixed schedules because they feel that training in human relations should be given only when it is related to some current problem.

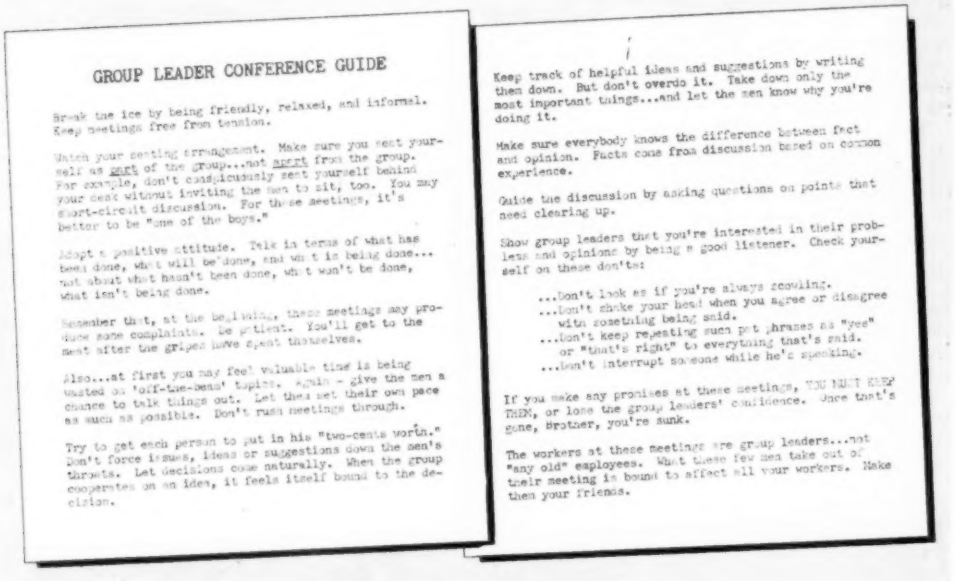
It is generally agreed by companies that have carried on both types of courses that the task of training supervisors in human relations is never completed. New situations constantly arise, and old ones must be reviewed.

In one company, the first series of human relations courses included: breakdown of the supervisor's job, the human element, best methods for inducting workers, building morale, how to handle individual worker's problems, and absenteeism. In this manner, practical problems of operation were combined with training in human relations.

Extensive training in the psychological aspects of handling people is offered by many companies. Included are such subjects as individual differences among workers, practical psychology on the job, types of people who have to be handled with special care, and rules for good mental health.

Harvester's Plan

International Harvester Company recently found that one of the strongest elements working for



GROUP LEADER CONFERENCE GUIDE

Break the ice by being friendly, relaxed, and informal. Keep meetings free from tension.

Watch your seating arrangement. Make sure you seat yourself as part of the group...not apart from the group. For example, don't conspicuously seat yourself behind your desk without inviting the men to sit, too. You may short-circuit discussion. For these meetings, it's better to be "one of the boys."

Adopt a positive attitude. Talk in terms of what has been done, what will be done, and what is being done... not about what hasn't been done, what won't be done, what isn't being done.

Remember that, at the beginning, these meetings may produce some complaints. Be patient. You'll get to the meat after the gripes have spent themselves.

Also...at first you may feel valuable time is being wasted on 'off-the-beam' topics. Again - give the men a chance to talk things out. Let them set their own pace as much as possible. Don't rush meetings through.

Try to get each person to put in his "two-cents worth." Don't force issues, ideas or suggestions down the men's throats. Let decisions come naturally. When the group cooperates on an idea, it feels itself bound to the decision.

Keep track of helpful ideas and suggestions by writing them down. But don't overdo it. Take down only the most important things...and let the men know why you're doing it.

Make sure everybody knows the difference between fact and opinion. Facts come from discussion based on common experience.

Guide the discussion by asking questions on points that need clearing up.

Show group leaders that you're interested in their problems and opinions by being a good listener. Check yourself on these don'ts:

...don't look as if you're always scowling.
...don't shake your head when you agree or disagree with something being said.
...don't keep repeating such pet phrases as "yes" or "that's right" to everything that's said.
...don't interrupt someone while he's speaking.

If you make any promises at these meetings, YOU MUST KEEP THEM, or lose the group leaders' confidence. Once that's gone, Brother, you're sunk.

The workers at these meetings are group leaders...not "any old" employees. What these few men take out of their meeting is bound to affect all your workers. Make them your friends.

***PRACTICAL RECOMMENDATIONS** on how to deal with specific situations go over best with foremen. Above guide explains how to get the most out of meetings with rank-and-file group leaders*

the success of its foreman instruction plan was the fact that the foremen themselves were given a voice in deciding on the course of study and the manner of instruction.

The company's foremen drew up a training plan based on what they judged to be the five main areas of foreman's work, including human relations, personnel development, company operations, economics, and technical operations.

In determining the course of study in human relations, International Harvester foremen decided that the supervisor should be trained in the following: human behavior, how people learn, labor-management relations, how to build a working team, relations of different racial groups.

They made the following recommendations for carrying out the program:

1. A condensed survey of the plan be made available before the training sessions begin.
2. The instructor should "talk the supervisor's language."
3. Maximum participation should be obtained by use of questions and answers.
4. Continual efforts should be made to see whether the training program is developing satisfactorily.

Also used extensively by many companies as an important adjunct to the training of supervisors in human relations is the familar Job Relations Training program of the War Manpower Commission.

An especially important part of any human relations program is printed material. Constant reminders, frequent check lists, manuals, case histories—all help to drive the message home in easily digested form. Several services are available to management to insure a regular flow of such material.

Good reading material can serve as the basis for good conferences. It prevents training sessions from rambling too far from the topical objective. Thus, a conference devoted to the supervisor's handling of a personal talk with a worker should prove helpful. A written checklist will cement the material fast. Checklists related to specific human problems are usually more useful than general advice.

For example: a series of practical recommendations on how to deal with the promotion problem will speed up the development of foremen by giving them a practical method of handling what usually develops into a difficult problem. Such a checklist is shown. Another example of the kind of information that foremen like is the group leader conference guide, also shown.

In the final analysis, labor relations is definitely a "selling" job—just as training for labor relations is a "selling" job. Once foremen have mastered the selling approach, they are well on their way to human relations success.

CHECKLIST FOR DEALING WITH DISAPPOINTED CANDIDATES FOR PROMOTION

1 . . Make a general announcement of the promotion to all workers.

2 . . Call in all those who had an eye on the job—make them feel at ease—overcome their suspicion.

3 . . Give them a chance to say what's on their minds.

4 . . Explain why the other man was chosen—his qualifications, etc.

5 . . Don't pass the buck upstairs by saying that the promotion was "out of your hands."

6 . . If necessary, offer to compare records of the successful and unsuccessful men.

7 . . End the talk on a positive note by stating that there will be other promotions and by urging the worker to continue his good work and improve his weak spots.

KNOWLEDGE OF HUMAN FACTORS GOES A LONG WAY

A proper knowledge of human factors goes a long way toward solving the many problems that arise in the following categories with which the foreman is concerned:

- Absenteeism
- Discipline
- Tardiness
- Slowdowns
- Grievances
- Layoffs
- Safety
- Waste
- Encouraging suggestions
- On-the-job training
- Merit rating
- Job planning
- Assigning work
- Breaking in new workers
- Meeting production schedule
- Keeping records and making reports
- Getting employee cooperation
- Improving foreman-employee relations
- Stimulating worker interest
- Giving orders to workers
- Explaining company policy
- Holding conferences with rank-and-file workers

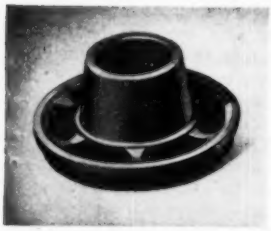
Jets Mix Bulk Fluids

APPLICATION of free jet to the mixing of fluids in bulk may reduce mixing time from several days to a few hours. After scale model experiments at the National Physical Laboratory, London, lead anti-knock compound for high-octane aviation fuel was mixed in a 15,000-ton underground storage tank, not equipped with conventional mixers. Using free jets for mixing, the time required was reduced five-sixths. The saving is still greater when more viscous oils are to be blended. The time for a 380-ton tank of lubricating oil was reduced from 48 hr to 1 hr, and for a 600-ton tank of mineral wool-combing oil from 7 days to 1½ days.

Process was described by H. Fosset and L. F. Prosser in a paper presented to the British Institution of Mechanical Engineers.

PRESS OPERATIONS PRODUCE TRICKY PART

Cold stamping overcomes obstacles of shape and tolerance after other methods of manufacture prove too costly



Retainer cap must be held to close tolerances on internal surface of conical shank and on ball races in flange. Part is major unit of Roto-Cap assembly

BY L. A. YOUNG, JR., President
BOWEN PRODUCTS CORPORATION

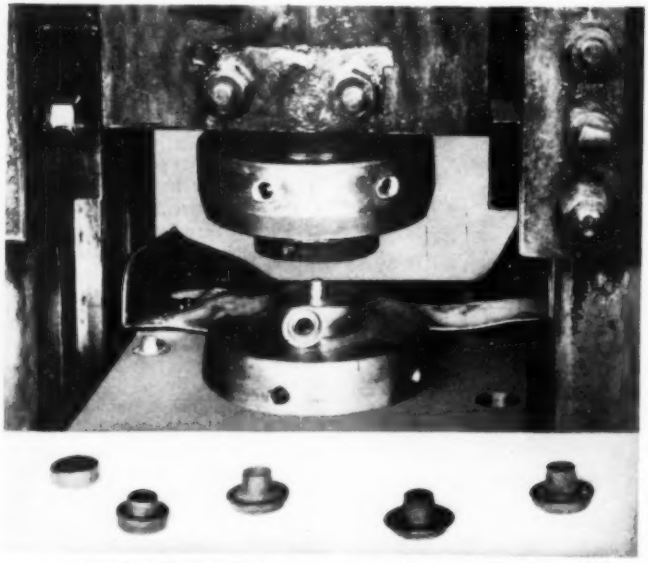
METAL - STAMPING techniques were the answer to a tough production problem at Thompson Products, Inc., Cleveland. They provided a method for low-cost mass production of the major part in Thompson's Roto-Cap, a device for the positive rotation of engine valves while in operation.

This part, the retainer cap, requires precision manufacture. Tolerances as close as 0.002 in. must be held in a taper of 14° 15′ on the internal surface of the shank. Here all parts having less than 75% bearing surface are rejected. Then, too, true and consistent ball races must be held to a set angle. As processing and tooling progressed, it was found that the retainer cap was difficult to manufacture accurately.

At first it appeared that the answer lay in breaking the retainer cap into two parts, the base and the shank, each to be fabricated individually, and the two brazed together. However, it was found that the brazing operation tended to throw the retainer cap off the close tolerance required. Additional machining was necessary, and the whole procedure was so expensive as to be prohibitive in cost.

The next approach was to cut the retainer cap from bar stock on screw machines. The ball races were then hogged out on the mill. This method somewhat lowered the cost but not enough to bring about mass acceptance of the Roto-Cap. Material handling, production time, and machine floor space requirements all contributed to the final rejection of this procedure.

Die casting and precision investment casting were also studied and rejected.

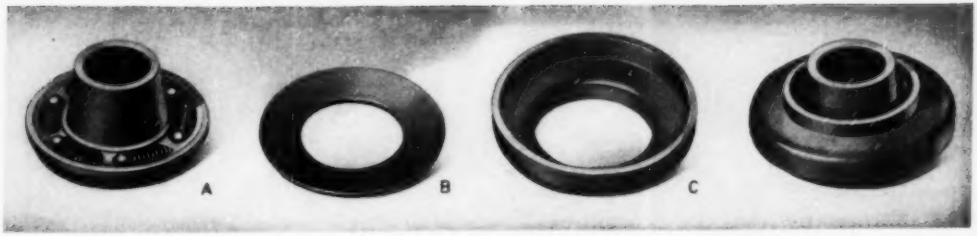


Progressive development of cap requires five steps. Starting with rough blank at left, part moves to initial form and pierce, wipe and coin chamfer and flange, a second similar operation, and finally wipe neck and coin ball races. Die is for fourth step

Plans for Press Work

At this point, the problem of finding cheaper and faster means of producing the cap was brought to the attention of Bowen Products Corporation, Ecorse, Mich., specialist in deep drawing and cold coining. Because of the particular shape and dimensional requirements of the part, cold stamping and coining had not been previously considered. With little in press work to serve as a precedent, it was a difficult job to attempt. Nevertheless, it was decided to go ahead with the project.

Bowen engineers, collaborating with Thompson on product redesign, arrived at the proper part



Roto-Cap assembly at right is made of five components: *A*, retainer cap, shown with balls and springs assembled; *B*, spring washer; *C*, seating collar. Washer is placed between *A* and *C* and collar is spun to cap. Retainer cap was difficult to make at low-cost

construction for coining and cold stamping the cap. Working from the last operation to the first, process men determined the limits of each operation. Experimental dies were built, and the long procedure of making the tool fit the part got under way.

It was found that C1008 cold-rolled steel, dead soft, was best for creating the closest possible tolerances. It flows evenly and in a manner that can be controlled. However, although original estimates of metal flow and displacement proved correct, there were important problems still to be licked.

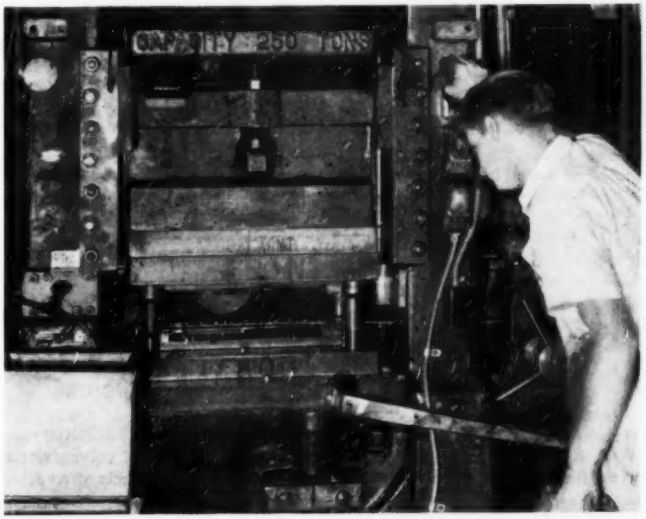
Obstacles in Forming

The main difficulty was in the forming of the conical section. It could not be drawn by the usual method because the tendency of the steel to stretch from the high point down created a tapering wall. Therefore, a different approach was developed.

Starting with a two-stage progressive die running in a 90-ton single-crank press, the stock is cupped and cut off. Cupping serves to start the shank on its way. The top of the cup is then cut away in a piercing die in a 50-ton press. Next, the part is annealed, pickled, and waxed in preparation for the coining operations to follow.

Wax is important because it closes the pores of the metal and allows for cleaner, truer surfaces during coining. It also aids in eliminating any scratches and scars that might form during the metal flow.

All coining operations on the retainer cap are done in 250-ton knuckle-joint presses, and the work is centered in the press bed to receive full benefit from the pressure created by the machine.



Progressive die combines blank, pierce, and initial forming operations on retainer cap for smaller Roto-Cap. Method reduces material handling and press needs

In the first coin operation the shank is sized and the bottom flange is preformed by squeezing the lower section to size. Flash is trimmed from the flange in a 50-ton press and the part is again annealed, pickled, and waxed. This treatment is necessary because constant working tends to crystallize the metal into a state of brittleness, which greatly impedes the flow in forming or drawing.

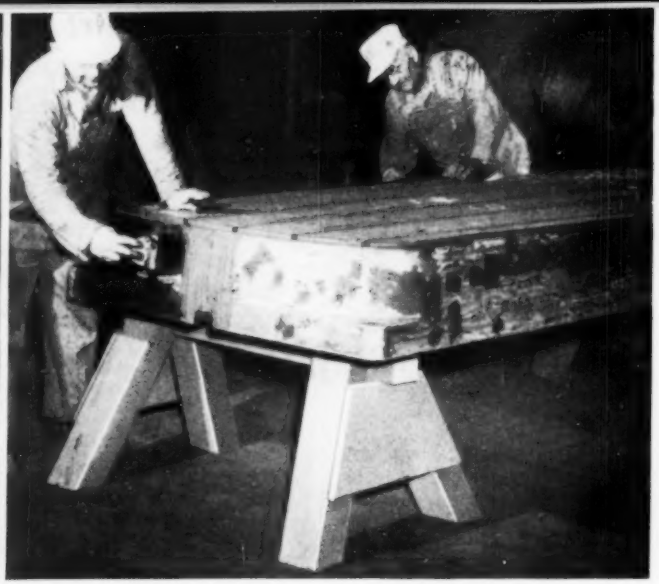
In the final coining die, the ball races and cup are stamped into place. Except for a facing operation to clean away the top and bottom burrs, the retainer cap is complete.

Coining and cold stamping reduced the cost of the product to about one fifth of what it was by the machining method. Moreover, because of the consistency of press-work, there was much less scrap, stoppage, and spoilage.

Only six months were required to establish production on the part as a stamping.

Bowen Products now has three types of retainer cap in production and is doing experimental work on two others.

Portable grinder offers a quick and easy method of smoothing off the high spots and cleaning a casting before painting



Filling and plastering with brush and putty knife, after priming, produces a level surface and is an essential preliminary to obtaining a smooth finish when the final coats are applied

HOW TO FINISH MACHINES

Paint is more than a beauty treatment. Proper original and maintenance finishing pay real dividends in lasting protection

BY R. E. GWYTHER and E. S. STOUT
Technical Service Dept.,
THE SHERWIN-WILLIAMS CO.

ORGANIC finishes are just as much engineering materials as any other material which goes into the building of a machine. The enamel or lacquer is a definite part of the production cycle and must be geared to it if production efficiency is to be maintained. Furthermore, the finish is a definite part of the product and serves a definite function. In many cases, continued satisfactory performance of the machine may depend upon it to a considerable extent.

The finish protects the machine against corrosion. It gives protection against water, alkaline materials, cutting oils, solvents, and often against the effects of weather. It provides a smooth attractive surface which is easily kept clean, and is used to control light reflection and to facilitate the work of the operator. Color is utilized to promote safety in operation. In addition, the finish itself must be highly resistant to chipping, marring, and abrasion.

A number of factors emphasize why the finishing materials must be selected carefully:

(1) Cost of application is many times greater than the cost of the finishing materials.

(2) Finishes must be used which will fit the production line schedule and production equipment.

(3) The primers, fillers, sealers and finish coats used, are required individually to meet application and drying requirements, and collectively to produce a well-integrated finish with the desired properties of adhesion, toughness, and resistance to a wide range of operating conditions.

Quality materials and careful application will produce a tough, durable, attractive finish which will give years of service. Machine operators appreciate the value of a finish which can easily be wiped free of oil, dirt, chips, and foreign matter.

There are materials available which will meet all needs; therefore, it is advisable to use materials which will meet production requirements and produce the desired quality of product.

Finishing Practice

Systems of finishing machine castings vary somewhat from one manufacturer to another. Each manufacturer usually finds it to his advantage to adjust the order of operations slightly to fit his own production line. The following schedule is used successfully by the Cincinnati Bickford Tool Co. in the manufacture of drilling machines

and is typical of machine-tool finishing practice:

1. Castings are prepared by grinding and sand blasting, followed by washing with solvent.
2. Spray coat of primer is applied and allowed to dry 15 min.
3. Filler is applied in combination knife and brush coat and is allowed to dry 3 to 4½ hr.
4. Castings are dry sanded by machine and by hand.
5. Spray coat of sealer is applied. Sealer dries in 15 min.
6. Parts are machined, assembled and tested. Machine is washed with solvent.
7. Nicks and scratches are patched with lacquer knifing putty which is sanded after 30 min.
8. Finish coat is applied by spray. Machine is crated in 1 to 3 hr.

Surface Preparation

In the preparation of castings it is imperative to remove rust, loose scale, dirt, and grease. Manual cleaning is slow and costly and the best available mechanical means, such as grinding, sand blasting, tumbling, or buffing, are recommended to accomplish the heavy work. Work done in this operation saves labor and materials later. Holes and scratches can be filled, but it is important to cut down the high spots of the castings. If high spots are left, the whole surface must be built up with filler, which is a waste of material. Furthermore, excessively heavy coats of filler tend to reduce the strength of the finish.

Immediately before priming, the casting should be washed carefully with solvent, or cleaned in an alkaline or solvent degreaser. Working surfaces can be masked at this point and may be left masked during the entire finishing operation.

The primer must provide adherence to the metal. The first coat is most important, and subsequent coats have relatively little effect on adherence of the finish to the metal. The second important requirement of the primer is to prevent corrosion, for it is the primer which is largely responsible for this protection.

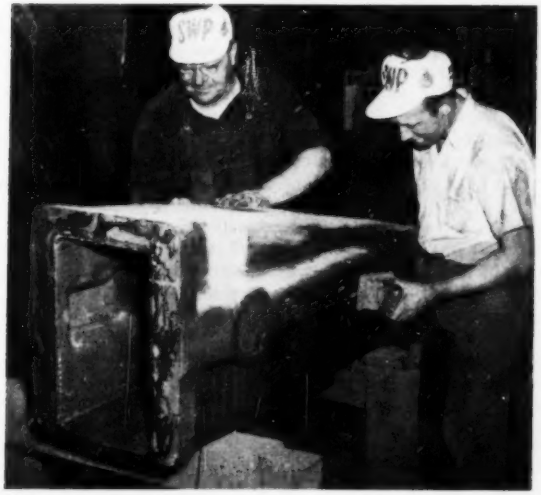
Castings should always be primed before storage. Some manufacturers prime the rough castings at the foundry. If the castings are to be stored outdoors, careful attention should be given to applying a heavy coat of primer, which must be of sufficient quality to provide adequate protection. Foundry primers are usually removed almost completely by the grinding or buffing operations when the casting is prepared for finishing and it is therefore necessary to reprime with the regular coat of primer.

Selecting Primers

In the selection of primers, the type of metal and condition of the surface are important. If a metal surface is greasy, adherence is largely determined by the compatibility of the primer with the grease. Newer synthetic primers are not compatible with grease and therefore more careful attention must be given to cleaning than is necessary for slower-drying oleoresinous types.

In priming zinc or magnesium, as well as some other metals, it is necessary to use suitable chemical pretreatment processes, or to select special primers designed to give adhesion to these metals. In finishing metals other than iron and steel it is best to consult a paint supplier. However, limitations in finishing these metals pertain to the primer only, and have little bearing on subsequent coats.

In applying primers, fastest drying usually results from spray application. However, there are often



Filler coat is carefully sanded down to the high spots of the primer but not deep enough to expose the bare metal. Operation may be performed either wet or dry

Sealing coat is sprayed over the filler to fill the pores, strengthen the entire paint structure, and act as a temporary finish coat to protect the surface

Bright surfaces are masked with paper to protect them from paint during the finish spray paint operation prior to crating and shipping the finished machine

good reasons to use other methods. Some castings are so big and heavy that they cannot be moved into spray booths, and are easier to finish by brushing. Dipping is often used because it is economical and because it will coat inaccessible surfaces.

It is possible in selecting a primer to select a color and gloss which will reveal surface irregularities and therefore aid the operator considerably in application of the filler. This idea is often carried on through the other coats, as it has been found that a slight difference in the color of successive coats is an aid to the operator, particularly in spraying.

Use of Fillers

The filler is used to fill holes and scratches and build up the casting to a smooth surface. It is usually applied by knife in the deeper holes and may be termed a putty when so used. It is customary to use the same material, reduced slightly, for application by brush or leather pad to the smaller scratches and holes, or over the entire surface. The filler must have good adherence to the primer and must harden thoroughly with minimum shrinkage and no cracking. It must sand readily without gumming or clogging the sandpaper. Sufficient filler must be applied to build up all low spots, but excess should be avoided as it is only necessary to sand it off again. It is frequently helpful to go over the filler shortly after it is applied, using a brush or leather pad moistened with solvent. This filler smoothing reduces the amount of sanding required.

Sanding is a slow and tedious job if done by hand. Wherever possible it should be done with mechanical sanders. The filler should be cut down to high spots of the primer, but not to the metal if it is possible to avoid it. Wet sanding is often employed because it is faster and reduces the dust. However, care must be taken not to contaminate inaccessible working surfaces with the sludge. Castings must be allowed to dry thoroughly after wet sanding.

Surface Sealing

Immediately after sanding, a sealer is applied by brush or spray to fill the pores of the filler, thereby avoiding striking in of the finish coat and insuring a uniform appearance. In filling the pores of the filler or surfacer, the sealer also tends to strengthen the system. It further serves as a temporary finish coat to protect the finish during the final machining and assembly operations. The sealer must, therefore, have good resistance to marring, chipping, abrasion, and cutting oils. Many manufacturers use two coats of enamel rather than one coat of sealer and one of enamel, and in this case the first coat of enamel performs essentially the same functions as the sealer coat.

Finishing Coats

After assembly, the surface must be cleaned with solvent to remove all dirt, oil, and grease. Polished metal surfaces not intended for painting are then masked. The surface is inspected and usually some small scratches or chips will be found as a result of the machining and assembly operations. These are filled with a putty, usually applied with a glazing knife. Putty used for this purpose must have high vehicle content to avoid need of a sealer to prevent striking in of finish coat. Putty is sanded smooth as soon as it is dry, and the machine is ready for final coat.

The finish coat completes the decorative requirement and is largely responsible for the resistance of the finish to marring, abrasion, and to the effects of water, gasoline, cutting oils, alkali, etc. It is the strength of the entire system, however, which is responsible for resistance to chipping, cracking, flaking and peeling. The finish coat must adhere to the undercoat, as in turn each coat must adhere to the surface beneath it. The finish coat is usually applied by brush or spray. A fast setup of the enamel or lacquer insures a clean, dust-free job.

There are usually some smooth metal parts on a machine, as for example, sheet-metal guards. In finishing these parts, no filler, sealer, or putty is needed, and the finish therefore consists either of primer and finish coat, or one coat of finish directly over the cleaned or prepared metal. In some cases, therefore, an additional requirement for the finish coat is that it must adhere directly to bare metal, and be a one-coat protective finish for the metal surface.

Maintenance Painting

Every machine eventually will need repainting, if only for the sake of appearance. At this point, the quality of the original finish and the careful work of the machine manufacturer pays dividends.

A high-quality finish, although in need of repainting for appearance, will still retain its fundamental qualities of adhesion and film integrity. The finish may become marred and scratched, but as long as adhesion is good and there is no evidence of peeling, cracking, or separation of one coat from another, the original finish should not be removed, but should be used as a base for the new coating.

If there are any areas where the old finish is in poor condition, the loose paint should be scraped off thoroughly. These areas can then be sanded or buffed, and the edges in particular should be cut down until they are smooth.

Sanding

The machine should then be sanded over its entire surface. This will remove small defects, and at the same time slightly roughen any spots which have been polished by wear. Sanding can be done with minimum effort using an electric-disk sander or an air driven buffer. It is best to finish off with fine abrasive paper to make it easier to get a smooth finish with the least number of coats.

After sanding, the machine should be wiped with solvent to remove all oil or grease. The surface should then be inspected for chips, nicks, and scratches. These may be patched up with a knifing putty. A lacquer-type putty is usually recommended as this will cut down the finishing time. Putty should be knifed into chips and scratches, allowed to dry, and then sanded lightly.

In sanding, some areas may be sanded through to the bare metal. It is best practice to touch up these spots with a coat of primer. After the primer and putty are dried, one or two brush coats of enamel may be applied, as required, to give satisfactory appearance.

Methods of application of finishes are dictated to a large extent by the production equipment available. Spraying is generally considered the best means of application for the finish coat because it gives the smoothest and cleanest job. It produces the fastest setup, which helps shorten production time and produces a clean, dust-free finish. However, it is necessary to have spray guns, lines, tanks, pressure equipment and spray booths; in addition, it is usually necessary to have conveyors to transport heavy parts to and from the spray booth. Many castings are too large and heavy to move in and out of spray booths. The Cincinnati Bickford Co. has solved this problem by building down-draft areas in which spray dust and fumes are removed through vents in the floor.

Brushing is a slow production method from the standpoint of labor and drying time. Slow solvents must be used to provide flow, and these slow down the drying. An advantage to brushing is that little equipment is required. The finish can sometimes be applied by brush while the parts are moving along idle points in the conveyor. Many bulky parts can be coated more easily by brushing than by any other method.

Dipping is an excellent means of application, especially for small parts. Little labor is required, and surfaces can be easily coated which might be difficult to coat by other methods. In finishing larger pieces dipping may become much more complicated. Large inventories of primer may be tied up in a tank. Special equipment is necessary, including large tanks equipped with agitators, storage tanks and pumps for emptying and filling the tank, and provisions for mechanical dipping. In finishing larger parts, flocoating is sometimes a better method. Flocoating involves pumping the primer or enamel over the article to be finished. It produces a coating similar to a dipped coat, but operates on a small reservoir of paint and does not involve tying up large quantities of paint in a dip tank.

Drying and Baking

Methods of drying are determined by the production schedule and equipment, and the speed of finishing is primarily determined by the speed of drying of the various finishing materials. In those plants where there is no conveyor, and as a consequence, delay in drying will not hold up other operations, slow drying materials are often adequate. In conveyorized production, fast air-drying or baking is preferred. When ovens are available for baking, it is usually a simple matter to obtain baking finishes which will conform to the production schedule of the oven. Some castings, however, may be so big that baking is impracticable.

If ovens are not already installed, and drying schedules are limited, materials of almost any necessary drying speed are available. New fast-drying synthetic primers, sealers and enamels approach lacquer in speed of drying, and at the same time have good film properties and chemical resistance. In rigid production schedules where extremely fast-drying materials are needed, it may be necessary to use lacquers. Here again a high-quality finish may be obtained, although usually at a higher coast.

As a rule, the slowest-drying member of the system will be the filler. Because of the need for smooth working properties, slow-evaporating solvents are used, and the heavy film prevents rapid release of the solvents. If it is necessary to use a lacquer-type filler for faster drying to sanding hardness, it is usually best to adopt a lacquer system throughout.

Choice of Finish

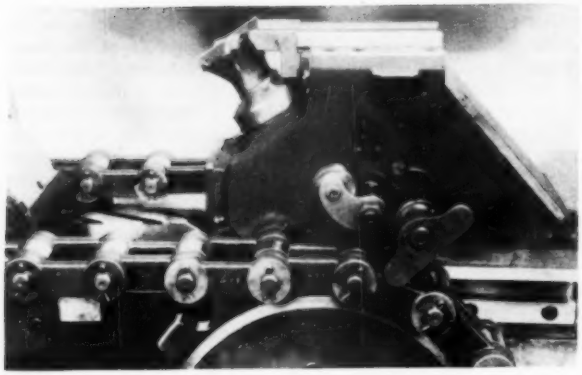
In the selection of materials it is necessary to consider two major principles:

1. Each coat must fit the production schedule.
2. The complete finish must meet service requirements.

In evaluating finishes, it is a simple matter to make a practical test of each coat to determine whether it fits the application and drying requirements of the production schedule. To test the finish for quality, a few simple tests can be made on a finished panel, to include at least the following:

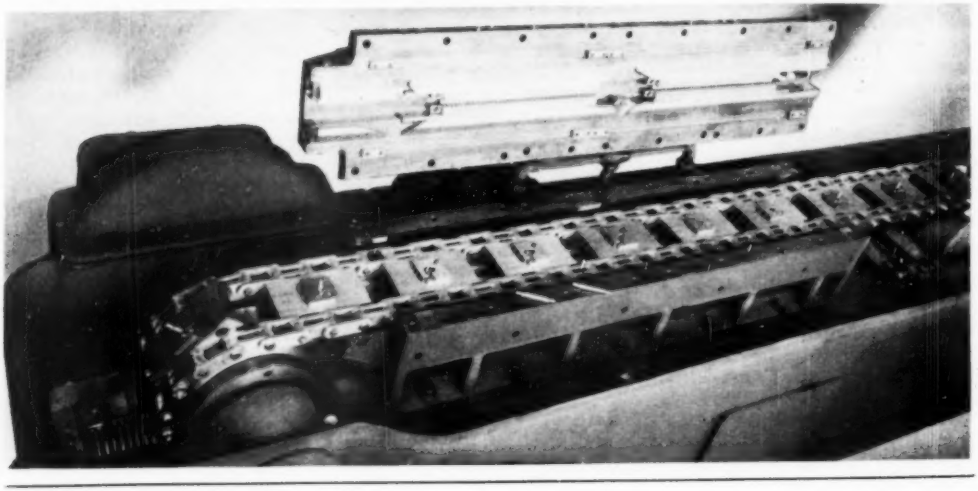
1. Toughness and adherence.
2. Resistance to marring and chipping.
3. Softening in contact with lubricating oil or gasoline.
4. Softening in contact with cutting oils and/or mild alkalis.
5. Resistance to any special solvent or chemical which may be encountered in service.

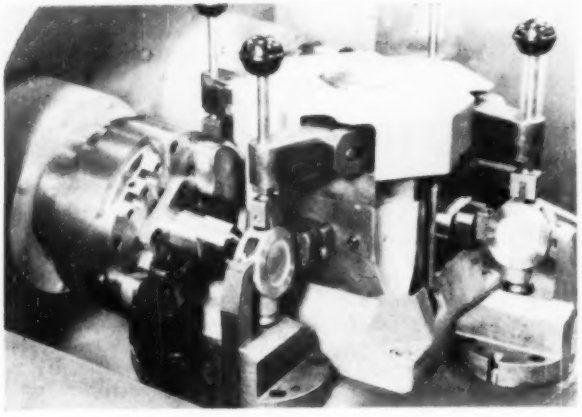
· TALENTED TOOLING



TUNNEL BROACH MACHINES AT HIGH SPEED

Continuous-broaching machine produces 770 forged-steel rock bits per hour by indexing fixtures between two 30-in. broach sections in the tunnel and with parts fed through twice (left). Both sides of four flutes are cut at 45 fpm. Flat fixtures holding shackle studs (below), also index 90° between two sections so studs are cut square on the ends. Double running finishes both ends. *Foote-Burt*



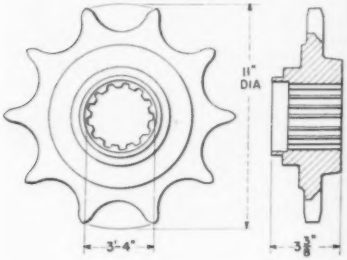


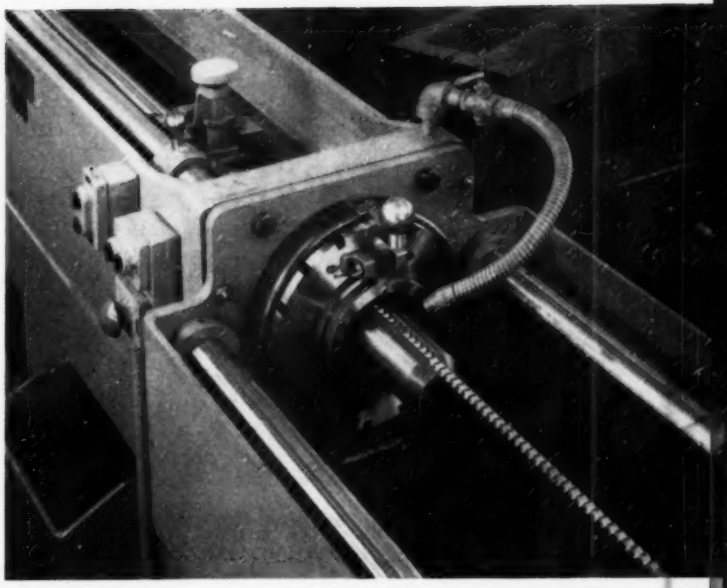
BORING-MACHINE TURRET POSITIONS VALVE PARTS

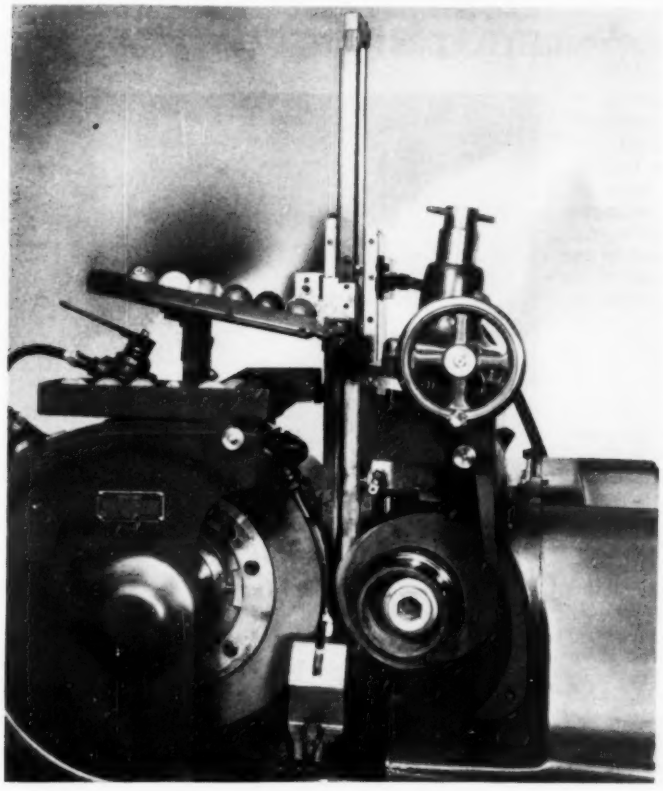
Valve wedges with opposite sides at slight angle to each other are faced off by two-station cross-feed units on an automatic boring machine. Parts are hand-clamped in station at right and are automatically rotated into four positions by turret. *Heald*

INDEXING PLATE CLAMPS SPROCKETS FOR SPLINE BROACHING

Involute and straight splines with up to 16 teeth are cut with a simple keyway-type tool. Roller-chain sprockets are clamped in adjustable indexing plate which locks in position. Two form tools make 48-in. passes at each position to turn out four finished sprockets per hour. *Oilgear*







CRADLE LOADS BILLIARD BALLS FOR GRINDING

Plastic pocket-billiard balls are trued to spherical shape in centerless grinder with special work-handling devices attached. Hollow carrier is formed like a bottomless cup and works in a vertical slot. New ball is lowered from top loading tray down to work blade where carrier fits around the blade and drops below the ball. After grinding, carrier lifts ball to lower tray, is tipped to unload ball into chute. *Cincinnati Milling*

FURNACE BRAZING IMPROVES REFRIGERATOR PARTS

Sound, gas-tight joints are produced, and substantial time savings effected at Westinghouse plant

BY WALTER RUDOLPH

Copper wire is wound around the coils which have been clipped to the backplate, and the strainer unit is assembled with preformed wire brazing rings

CONTINUALLY seeking better methods of joining metals with sound, leakproof joints, Westinghouse Electric Corp. has devoted extensive study to furnace brazing. Several excellent examples of the technique are in use at the E. Springfield, Mass., plant in the manufacture of refrigerator parts.

One of the largest units processed is the backplate condenser. This consists of a 15x48-in. mild sheet-steel plate, 0.064 in. thick, having small tabs pressed out at appropriate places. Quarter-inch Bundy tubing is formed into a series of return bends, and secured to the plate by manually bending over the tabs. No. 14 copper wire is then wound back and forth over the tubing, and a previously assembled strainer unit is placed on one end of the tubing with preformed copper rings at the joint.

The entire assembly is placed on a chrome-nickel, continuous conveyor belt which carries it through a controlled-atmosphere brazing furnace. This has an 8-ft. heating chamber and a 24-ft. cooling chamber, and is electrically heated to 2050 F. Conveyor speed may be varied on specific items to insure proper heating and flowing of the brazing metal. The entire area of the tubing must be brazed to the plate in this operation, and only small skips are permitted.

After brazing and cooling, the assembly is

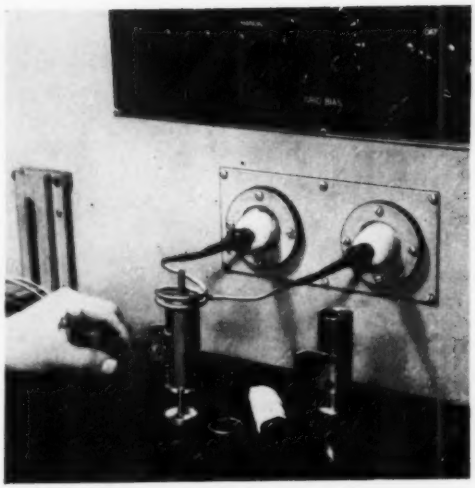
Backplates assemblies are lubricated and press formed to a curved contour to fit the rear of the refrigerator casing

carried by conveyor to a forming press where it is given a slight trough shape for assembly to the back of the refrigerator. A leak test follows, then the brackets are attached with self-tapping screws, the unit is painted, and routed to final assembly.

Other brazing jobs performed in the same furnace include the assembly of the ball mufflers used in commercial compressors; mounting bolts consisting of machine bolt, washer and spacer; and fan case assemblies in which a plug is brazed into an opening in the bottom.

An interesting related operation involves induction heating for soldering the cap in a dryer assembly in which heat transfer must be restricted to avoid burning the cloth bag containing a drying compound which forms an integral part of the dryer unit.

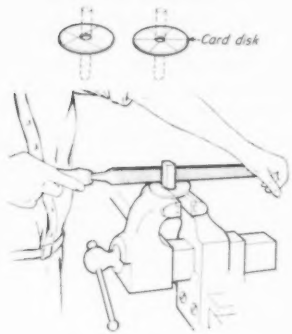
The joint must be Freon-tight. The individual parts of the dryer assembly are copper brazed, then the cap is pressed into the tube containing the drying medium and the joint fluxed with a neutral compound. A silver solder ring is positioned at the joint, and the unit placed inside the work coil of the induction heater. Soldering is effected in only a few seconds at 1400 F.



Dryer units containing a cloth bag of drying compound are assembled and silver soldered on an induction-heating unit. This avoids burning of the bag

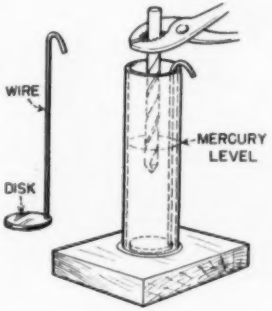
Short Cuts FOR THE SMALL SHOP

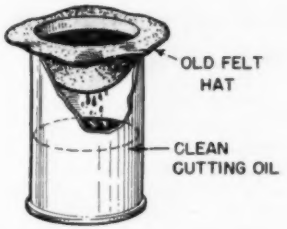
BY A. H. WAYCHOFF



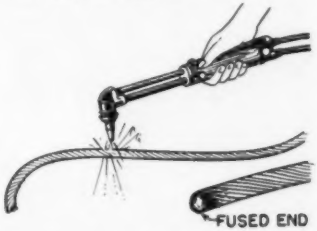
FILING GUIDES are a useful accessory, especially when one must file a square or triangular end on round stock. To make a guide, punch a hole in stiff cardboard, making the hole a snug fit on the stock. Then lay out cross-lines to divide the circle into quarters or thirds. Slip the guide over the stock clamped in the vise. Rotate the work and guide until one cross-line is parallel to the vise jaws. File parallel to another cross-line. Turn the rod and disk each time.

QUENCHING special drills into mercury develops extreme hardness, so that the tool will cut very hard materials. To do this, cap a short nipple, drill a block of wood, and stand the capped nipple in the hole. Make a small drill support of a disk welded to a piece of wire long enough to be hooked over the open end of the nipple and with the disk near the bottom. Pour an inch or two of mercury into the nipple. Quench the heated drill point into the mercury. Use the wire support to withdraw the hardened tool, if too short to grip with pliers.





FILTERING small quantities of expensive cutting oils can be handled in this way: Set an old felt hat over a tall can, pour in the dirty oil. The oil will filter through the felt and the latter will catch even the very fine chips.

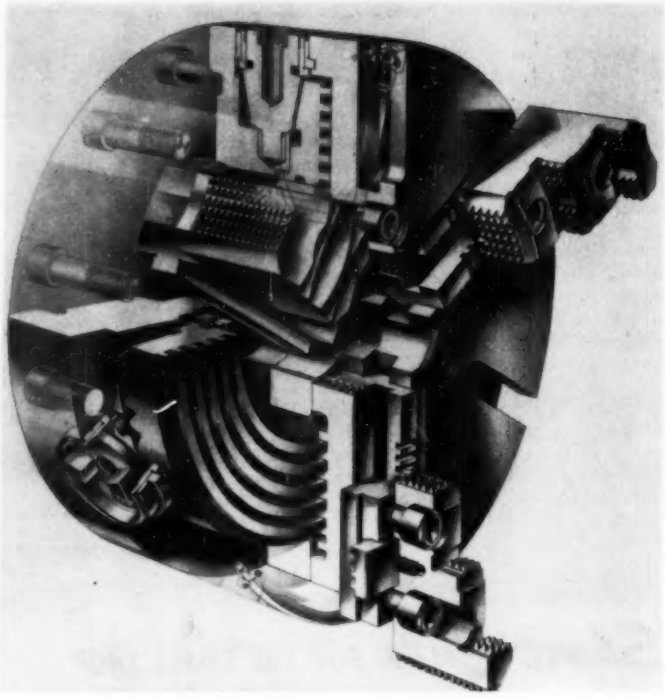


NON-FRAYING ENDS on wire cable are produced by cutting the cable with a torch, instead of using a saw or bolt cutter as is so frequently done. A clean cut is made by the torch and the wires are fused together so they do not fray.

SCROLL CHUCK PARTS NEED VERSATILE TOOLING

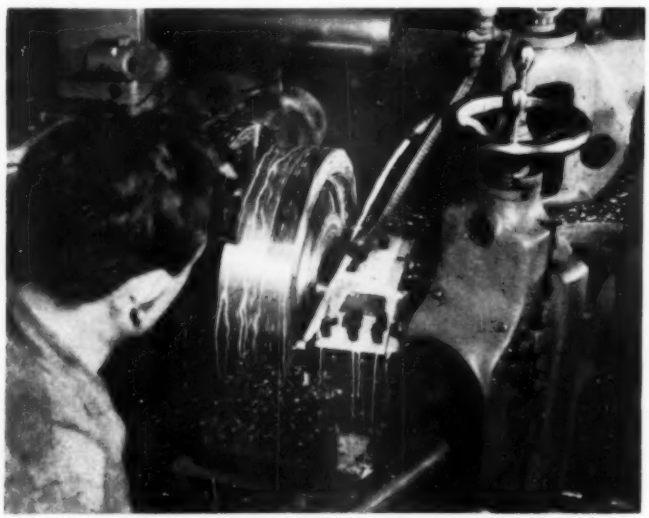
BY GEORGE KLUTER, Works Engineer
The Warner & Swasey Co.

Setups to produce parts for scroll chucks require modification of several machines with unusual tooling

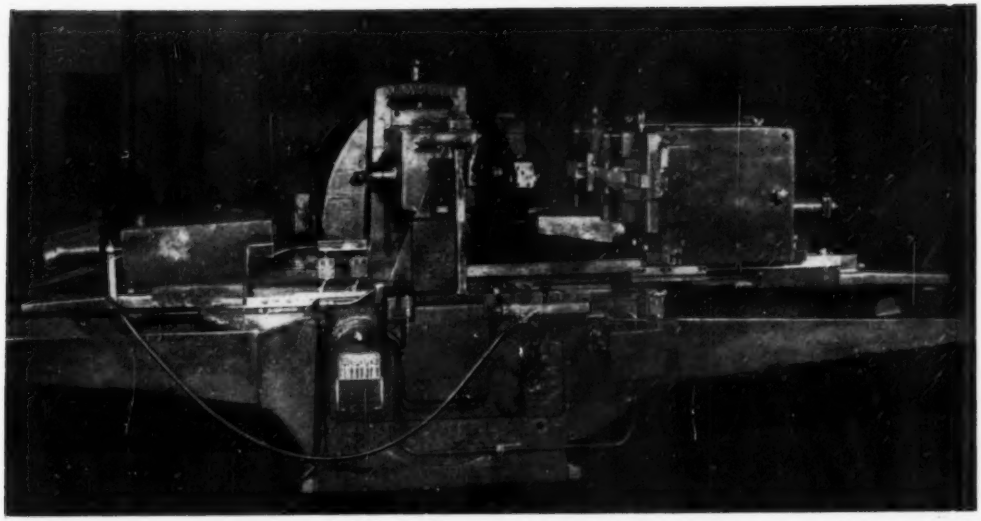


MANUFACTURE of a scroll chuck—a compact assembly designed to exert substantial pressure under sensitive control—calls for precision workmanship. Scroll chucks must have the accuracy needed for finishing operations, fast operation to minimize idle time, sensitivity to grip flimsy work without crushing, and adjustability to fit a wide size range of work. Toolmaker's tolerances are involved in the generation of pinion and scroll gear teeth to reach full bearing pressure *after* load is applied, rather than in initial gear contact.

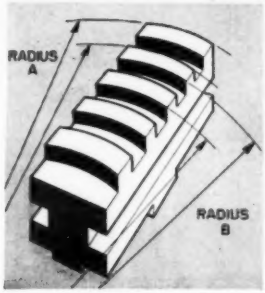
Some of the most interesting setups from The Warner & Swasey Company's chuck manufacturing operations are illustrated here.



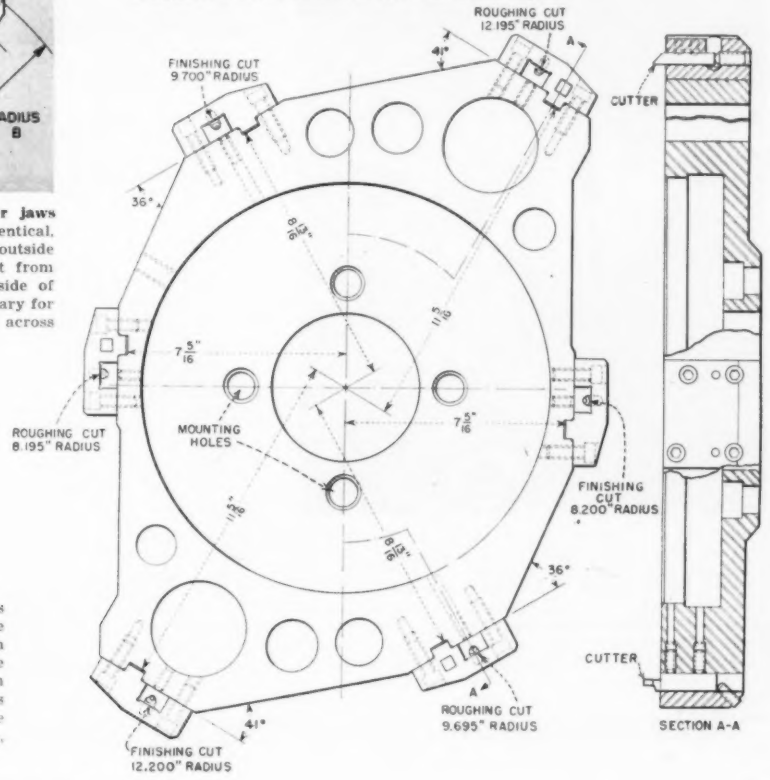
Trepanning the chuck body on a 4A turret lathe with a wing cutter. The body is a forging of high physical properties. In cutting out the inside for the scroll, considerable metal must be removed. The wing cutter, mounted in the hexagon turret, divides and balances the heavy cut. Two smaller cutters, one in each wing, avoid excessive loads concentrated on the work, tooling, and machine. Slots in the cutter block are serrated to adjust for different-sized chuck bodies. Tool slots are at a 5° angle for fine sizing adjustments. The two cutters are parallel so one sizes the bore and the other the hub of the scroll recess



Simplex milling machine is tooled to cut two jaws at one time. Right-angle cutting head added to the milling machine mounts a series of large inserted-blade cutters. The automatic air-operated indexing fixture at right has cycling controlled by standard machine stops. Index for thread pitch is air-operated and controlled by solenoids and stop dogs from table motion. An electric timer is adjustable to set number of teeth cut in each cycle

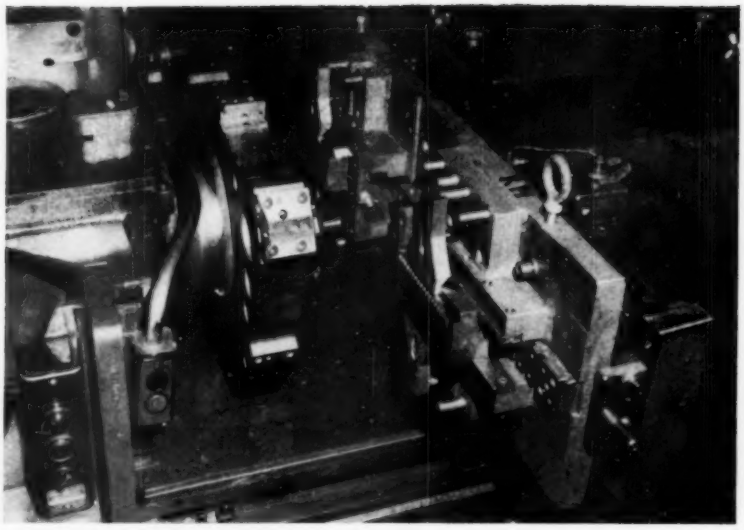


Scroll threads on master jaws are cut so each tooth is identical, but the radius **A**, on the outside of each tooth is different from the radius **B**, on the inside of each tooth. This is necessary for clearance as jaws move across the scroll

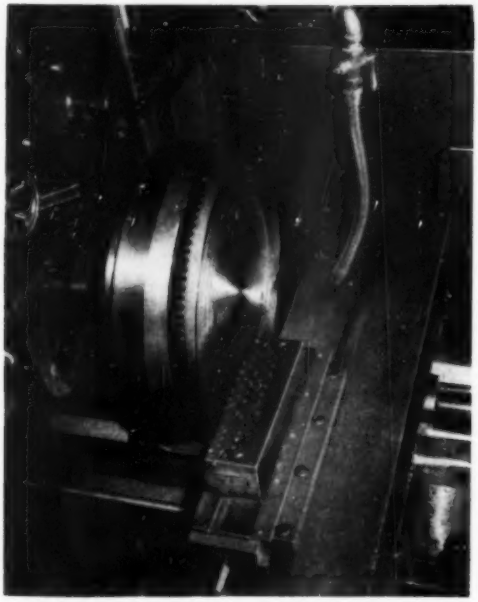


Each milling cutter has six blade positions. One cutter will handle rough and finish cuts on three chuck sizes, but only on one side of the teeth. This cutter is for the inside radii of teeth for 18-, 21-, and 24-in. chucks

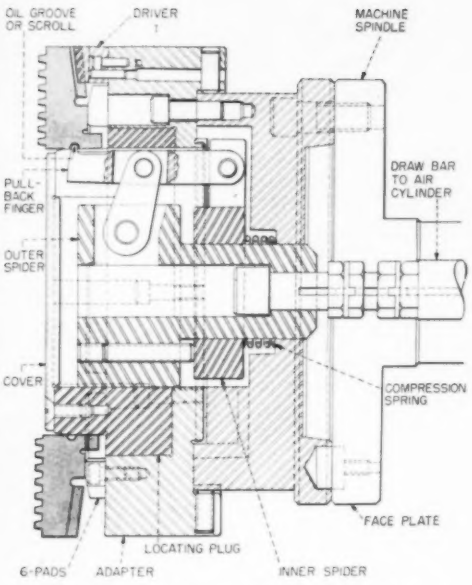
SCROLL CHUCK
continued



Two chuck jaws are mounted in automatic fixture while rough and finish cuts are made on one side of each tooth. Jaws must be mounted a second time with different space between them, and a different milling cutter mounted on the head, to mill the other side of the teeth



Cutting the scroll thread is done after the scroll is hardened. Carbide cutters, used on nearly all chuck parts, are a necessity here because of hardness. A turret lathe with a special cross-slide and cutter block does the job. The cross-slide is tied to the spindle through a gear train to maintain the lead relationship. Different leads are selected by a shift lever on the cross-slide apron. Cutters are set in the tool block so each takes an even increment of cut. The roughing cutters pass all the way across the scroll before the finish cutter starts to cut. Once the block has been located on the cross-slide by a slot and key arrangement, no further adjustment is needed. Depth of cut is controlled by a ratchet-feed indicator device



Holding fixture for scroll while thread is cut is an air-operated drawback type. Three pairs of fingers, equally spaced around the fixture, locate in an oil groove on the inside of the scroll. These fingers pivot on the inner spider and are expanded by three cam-action levers connected to the outer spider. When the scroll is placed on the fixture the outer spider is drawn back, expanding the fingers until they are stopped by the scroll. Both spiders then move back until the scroll is drawn tightly against six locating pads. A driver fits in the pinion teeth on the rear of the scroll. A 10-in. air cylinder provides the power required to pull back the draw bar

Ability to use a file efficiently has long been the hallmark of the skilled craftsman. Nothing can replace the light touch of a judiciously applied file in critical fitting.

Discretion must be used in selecting the right file for the job, according to the type and quantity of metal to be removed and the shape of the workpiece. High-quality work requires first-class files, and the low cost of poorly made tools does not pay off in production

How to Choose and Use Files

BY GRANT LOADER, PLANT SUPT., HELLER BROS. CO.

METALWORKING files are broadly divided into three major categories, each of which is designed for a specific purpose. All, however, have certain points in common in their general design. The length of a file is the length of the actual blade, not counting the tang. The tang is the pointed end which is not hardened, and which is to be fitted to the handle. Some types are made without tangs, and others with integral metal handles. The name refers to the shape or style, and the cut has reference to the character and coarseness of the teeth. The heel is the shoulder adjacent to the tang, and the point is the end opposite to the tang. Files may be made blunt, that is, parallel in width and thickness from heel to point, or tapering in both width and thickness.

Standard cuts in a file are either single-cut or double-cut although some special and patented cuts such as wavy-cut and curved-cut are available and have the advantage of increased life, faster cutting, easier clearing and improved finishing without scratching or serrating.

A single-cut file has a single set of diagonal rows of teeth, parallel to one another and extending across the face of the file. A double-cut file has two sets of diagonal rows. The first set is called the overcut. On top of these, a second set is cut at a different angle to the file axis, and known as the upcut. These rows are finer and deeper than the overcut.

The tooth spacing, or number of teeth per inch, varies slightly with the make of file and increases in proportion as the length of file increases. For example, a 12-in. mill smooth file has a coarser cut than a 6-in. mill smooth file. Bastard cut is coarse; second-cut is medium coarse; smooth-cut is fine. In addition, there are a few files coarser than bastard and a few smoother than smooth, but these have a limited use and are not referred to in this report. In comparing different degrees of coarseness, the terms bastard, second-cut, and smooth are accurate only when the same length and shape are considered.

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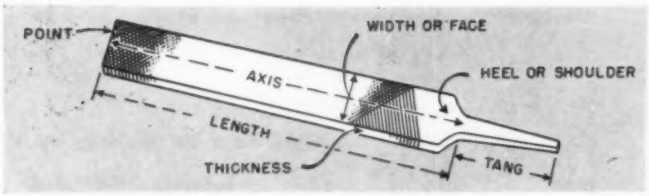


Standard nomenclature for the various parts of a file should be understood and used to prevent confusion in ordering from the vendor or tool crib

Single-cut file has a single set of diagonal rows of teeth (left). Double-cut file (right) is more commonly used

Types of Files for Metalworking

Machinists' Files

As their name implies, machinists' files are the type most commonly found in machine shops, and have innumerable applications in all types of manufacturing and assembly plants, garages, and repair shops of every description. Fast-working files, they remove metal rapidly and are generally used wherever smooth finishing is not the primary objective. They are available in nine different shapes to cover almost every possible application, and vary in length from 4 to 18 in., depending on type and use. In general, sizes move up by 1-in. steps from 4 to 8 in., and by 2-in. steps from 8 to 18 in. They are usually made in double-cut, except small rounds and the backs of fine-cut half-rounds which are made single-cut.

Flat files are of rectangular cross-section, tapering in both width and thickness. Hand files are somewhat thicker in relation to their width, and taper in thickness but are uniform in width. Pillar files are almost square and are also uniform in width but tapered in thickness. Warding files are thin and taper sharply in width, but are uniform in thickness. Square files are square, and may be either tapered or blunt. Three-square files are triangular in cross-section and may be tapered or blunt. Round files are of circular cross-section and may be blunt or tapered, the latter being commonly known as rat-tail. Half-round files are flat on one face, curved on the other, the curvature being about one-third of a circle. They are usually tapered but may be blunt. Knife files are knife shaped—thicker on one edge than the other—tapered, and curving to a point at the end. In addition to these, the mill file is often used by machinists for draw filing, particularly the single-cut type. These files are similar to hand files, but somewhat slimmer, and taper slightly in width and thickness.

Swiss Pattern Files

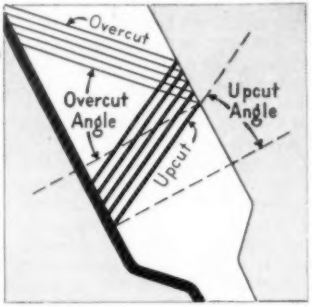
In comparison with machinists' files, Swiss pattern files are made to more exacting specifications. They are supplied in types and designs particularly suited to fine work, and are used by precision tool and instrument makers, aircraft manufacturers, die sinkers, gunsmiths, silversmiths, jewelers, watch and clock makers, and model and pattern makers.

Cuts are much finer than for Regular, or American, pattern files, and although both types have the same geometrical cross-sections, they may be readily distinguished. Swiss types are more slender, being narrower in both width and thickness; the point is smaller and the taper longer. They are somewhat lighter in weight and have the teeth extending to the extreme edges.

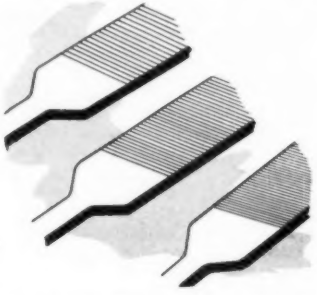
The more common types correspond in form to the standard machinists' types, but there are hundreds of other shapes and sizes designed for special jobs, including needle files with round, knurled handles for use by makers of dies, tools, jewelry, clocks and watches. These are very delicate and are used for fine work such as pierced designs in thin metal. Escapement, or watch, files have square handles and are smaller in diameter than needle files. Die-sinkers' and silversmiths' rifflers are curved, double-ended files curved upward at the ends, and are used for getting into the corners, crevices and holes of intricate dies and for other delicate work.

Special-Purpose Files

In addition to general-purpose files such as machinists' files, there are a number of so-called special-purpose files. These are specially designed



First row of teeth on a double-cut file is called the overcut. Second row is finer and deeper and is designated the upcut. Angles of the two cuts are not identical, as shown above



Bastard-cut file (top) has relatively coarsely spaced teeth for heavy stock removal. Second-cut file (center) has medium spacing, and smooth-cut is closely spaced for fine finishing

for a particular kind of work such as lathe filing, or for a particular material such as aluminum, stainless steel or plastics.

The need for special-purpose files is a result of the ever-growing specialization that has entered into modern machine shop work. Like any cutting tool, a file must be scientifically selected for the work it is to do. Its teeth must have the correct rake, clearance, sharpness and form. These and other important factors vary with different materials. They are not the same for brass as for cast iron. Stainless steel requires still different characteristics. Only when the proper file for a given job is selected can the best performance be obtained.

The brass file has a tooth design that incorporates sturdiness and sharpness. It is non-clogging. It cuts brass rapidly, yet gives a smooth finish without chattering or scratching, and without grooving or running off the work.

Aluminum is a ductile, malleable metal. It is softer than brass, and for this reason the aluminum file has a special tooth design, with a fine light overcut, and a coarse, deep, open upcut, so it will not clog, chatter or channel under average working conditions. It cuts rapidly, even with moderate pressure. At the same time it leaves a good, smooth finish, without scratching.

Lead is a much softer metal than either brass or aluminum. For this reason it calls for a file that under ordinary pressure will rapidly, yet smoothly, shear away the metal in thin shavings or fine scallops. The special purpose lead float file has a short angle and coarse, single-cut, ridge-like teeth that do this very satisfactorily.

The foundry file is intended to file rough iron castings. Because such work would be ruinous to a file of standard design, the foundry file is equipped with sturdy, strong teeth that will stand the punishment of core sand, sharp edges, fins, sprues, hard projections, and shock without shelling or breaking out.

The special-purpose, long-angle lathe file has teeth cut at a much longer angle than the teeth of a standard mill file. This makes possible a genuine shearing, clean cutting action without dragging, tearing or chattering. It means faster, smoother cutting and a superfine finish. Also, it permits greater chip clearance and reduces clogging or scoring. Teeth are on the flat sides only to permit the file to be used, without causing damage, in proximity to the chuck or abutting piece, or to any shoulder on the work itself. Because the file is fast-cutting, only slight pressure is needed to give the work a fine smooth finish.

Selecting the Right File for the Job

REGARDLESS of the work to be done, it always pays to use a quality file. Such a file is most economical in the long run. It can be counted on not only to do more work in less time with less effort, but also to do it better. A good file possesses high cutting efficiency, uniformity, and durability. It is necessary to understand clearly what these terms mean.

Cutting efficiency is a function of tooth design, construction, and pattern. It depends in particular upon six factors: Sharpness; slope of the front face of the tooth, or rake; slope of the back face of the tooth, or clearance; angle of the cut relative to the axis of the file; pitch, or coarseness of the cut; and ratio between the pitch (number of teeth per in.) of the upcut to the overcut. Sharpness, indicated by well-shaped teeth, establishes the rate at which a file cuts.

A file is said to have uniformity when both sides are equal in cutting efficiency and durability.

Durability of a file is indicated by the total number of strokes it gives throughout its working life. For a good file, made of quality steel, this number will easily reach several hundred thousand strokes, whereas a poor file invariably fails within one-tenth that number or even less. Durability is an important factor—

FILE FINDER FOR MACHINISTS' FILES

CROSS-SECTION	NAME	SHAPE	CHARACTER OF TEETH	TAPER	GENERAL USES
	Flat	Rectangular	Usually bastard. Also second-cut and smooth.	Tapered both in width and thickness.	A general-purpose file.
	Hand	Thick Rectangular	One edge safe. Bastard, second-cut and smooth.	Uniform in width, tapered in thickness.	Finishing flat surfaces.
	Pillar	Almost square	One edge safe. Bastard, second-cut and smooth.	Uniform in width, tapered in thickness.	Keyways, slots, narrow work.
	Warding	Thin	Usually bastard. Also second-cut and smooth.	Width sharply tapered thickness uniform.	Filing ward notches in keys. Narrow work.
	Square	Square	Bastard, second-cut and smooth.	Either tapered or blunt.	Enlarging holes or recesses. Mortises, keyways and splines.
	Three-Square	Triangular	Sharp edges. Bastard, second-cut and smooth.	Either tapered or blunt.	Filing acute angles, corners, grooves, notches.
	Round	Circular	Usually bastard. Also second-cut and smooth.	Either tapered ("Rat Tail") or blunt.	Enlarging holes; shaping curved surfaces.
	Half-Round	Third-Circular	Usually bastard. Also second-cut and smooth.	Usually tapered, sometimes blunt.	Concave corners, crevices, round holes.
	Knife	Knife-Shaped	Usually bastard. Also second-cut and smooth.	Tapered, curving to a point at the end.	Cleaning out acute angles, corners, slots.

FILE FINDER FOR SWISS PATTERN FILES

CROSS-SECTION	NAME	SHAPE	CHARACTER OF TEETH	TAPER	GENERAL USES
	Hand	Rectangular	Double-cut on two flat faces and one edge. Other edge safe or uncut.	Uniform in width, tapered in thickness.	Flat surfaces.
	Pillar	Width narrower than Hand File	Double-cut on two flat faces. Both edges safe.	Uniform in width, tapered in thickness.	Flat surfaces, slots.
	Warding	Thin Rectangular	Double-cut on two flat faces. Single-cut on two edges.	Tapered in width, uniform in thickness.	Slots
	Square	Square	Double-cut.	Tapered	Corners, holes.
	Three-Square	Triangular (Equilateral)	Double-cut on three faces. Single-cut on edges.	Tapered	Corners, holes.
	Round	Circular	Double-cut.	Either tapered or uniform (straight).	Corners, holes.
	Half-Round	Third-Circular	Double-cut.	Tapered	Corners, holes.
	Knife	Knife-Shaped	Double-cut on flat faces. Single-cut on edges.	Tapered	Slots
	Crossing	Oval, with unequal radii	Double-cut.	Tapered	Corners, holes.
	Equalling	Rectangular	Double-cut on flat faces. Single-cut on edges.	Uniform throughout length.	Slots, corners.
	Barrette	Trapezoidal	Cut only on wide flat face. Other faces safe.	Tapered	Corners, flat surfaces, burring gear teeth.
	Crochet	Flat, with round edges	Double-cut.	Tapered	Slots, flat surfaces, rounded corners.
	Cant	Triangular, (Isosceles)	Double-cut on three faces. Single-cut on two sharp edges.	Tapered	Corners
	Slitting	Flat Diamond	Double-cut on four faces. Single-cut on two sharp edges.	Blunt	Slots, corners.
	Pippin	Apple Seed	Double-cut.	Tapered	Rounded corners, holes.

it determines the total work a file is capable of doing.

What File to Use?

The correct answer to this question depends on the kind of job, on the properties of the material to be filed, and on the manner of filing. The kind of job may be (a) filing a flat surface, (b) filing a curved surface, either convex or concave, (c) filing an edge, (d) filing a rectangular aperture such as a slot or notch, or (e) filing a square or circular hole.

The properties of the work to be considered are size, shape, and location of the surface to be filed, the nature of the material to be worked on, and its hardness.

Similarly, several factors determine the manner in which the filing is to be performed, such as (a) quantity of stock to be removed, (b) heaviness or lightness of cut, (c) depth of cut or bite, (d) speed of stock removal, (e) accuracy or smoothness desired, (f) rough filing or smooth finishing.

Typical applications for which the more commonly used files are recommended are given in the accompanying File Finder Charts, but the following comments should also be kept in mind:

Cast iron, soft steel: These are the metals on which files are most frequently used. For removing stock rapidly, select a flat bastard. If the work is of thin gage, a second-cut or even a smooth-cut file should be employed. For smooth finishing, choose a second-cut or smooth-cut. On thin or hard metals, use a smooth-cut only.

Copper, brass, bronze: On these metals a sharper file is required than for steel and wrought iron. This means that if the same file is to be applied on a piece of brass and a piece of iron, use it on the brass first. Then, after the file has become too dull for further work on brass, it can be used on cast iron, wrought iron or steel. For most applications, the special brass file has teeth of sufficient sturdiness and sharpness to do satisfactory work without clogging, grooving or skidding.

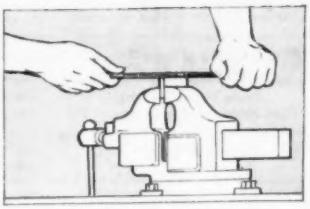
Aluminum: The special-purpose aluminum file with its coarse, deep upcut tooth construction will be found satisfactory for removing stock rapidly and leaving a smooth finish. The special tooth and open gullet design prevents clogging and chattering.

File teeth must be properly designed with correct rake and clearance angles for maximum cutting efficiency

Lead, babbitt, other soft metals: These metals are satisfactorily filed with the lead float file. Since metals such as lead and babbitt are much softer than copper and aluminum, the lead float file has a very sharp, open-tooth construction that cuts rapidly, yet finishes smoothly without clogging.

Castings, forgings: The scale customarily encountered on this work is very hard. It will dull the teeth of a new file after merely a few strokes. For this reason, a new file should never be employed on rough castings or forgings. Use only files that have become too dull for efficient cutting on other metals.

Sheet-metal work: Several file teeth should always be in contact with the metal being cut. If the cut of the file is so coarse that the metal gets between the teeth, there is a good chance of the teeth being broken, particularly if too much pressure is employed. For the best results, several file teeth should be cutting at the same time. A finer-cut file should be used for cutting thin stock—a coarser-cut file for relatively heavier stock.



Correct method of holding a file when working on thin stock. Several teeth should be in contact with the work at all times

Narrow surfaces: A file bites more freely on a narrow surface than on a wide one, since fewer teeth are in contact with the surface at any point in the stroke. Also, less pressure is required to make the file bite. It is generally better, on very narrow work, to use a file of fine cut and long tooth ridge. Such a file gives greater strength, and the shear of its cut is smoother—one tooth commencing to take hold as another leaves off. When an ordinary double-cut file is used it is liable to wear excessively or break.

Broad Surfaces: A broad surface requires a sharper file than a narrow one. If the same file is to be used on both a broad surface and a narrow surface, use it on the broad surface first. For this work, a file with pointed teeth has the advantage.

Flat surfaces: For filing a flat surface, a square file will be found to require less pressure than a flat or a pillar file. It is under better control, and responds more effectively to the touch and feel of the operator.

Concave Surfaces: For rough filing, an ordinary half-round file will be found satisfactory. But a square file is to be preferred, since it requires less effort to shape the surface. After the piece has been brought to the desired dimensions by cross-filing, it can be finished by draw-filing with a half-round or crossing file that has a radius of curvature less than that of the concave surface.

How to Use Files Correctly

IT SEEMS strange that it is possible to train an apprentice to operate a lathe, planer or milling machine and turn out good work, in much less time than it takes to teach him to do good filing. But such is the case. Flawless filing is an art. It is the mark of a first-rate craftsman. It recalls the old days when apprentices were given pieces of steel and made to file down smooth from the top edge to a line that had been scribed by the master craftsman. Then another piece was similarly treated, and the object was to file both pieces so smooth that they could be wrung together and made to adhere in the manner of Johansson blocks.

Filing, as an industrial art, must observe the basic principles governing the following: Holding the work; kind of filing operation; worker's stance; gripping the file; stroking motion; working pressure.

Holding the work: Most work that is filed is held in a vise. Unless it is held firmly, chattering and vibration result that cause the file teeth momentarily to lose contact with the surface and to vary the depth of cut—with unsatisfactory results.

The top of the vise should be on the same level as the elbow when the arm is bent. If the mechanic is of less than average stature, a small platform should be placed on the floor and the correct working height obtained in this manner. However, the work should be lowered if heavy filing is to be done. In die and tool making, much of the work is small and delicate. As this requires simply a movement of the arms or of one hand and arm alone, the vise and work should be higher—not only so the work can be more closely scrutinized and the movement of the file more accurately guided, but also so the filer may be able to stand erect at his work.

The high finish obtained after much time-taking effort may easily be marred if the work is held in the vise carelessly. To guard against this condition, polished work or soft metal should be protected by suitable pieces of copper, brass, zinc, tin plate or other fairly soft metal placed between the jaws of the vise and the work. Pieces of wood are best when working on aluminum or lead. For highly polished work on mild steel or for fine screw threads, pieces of leather are recommended.

Filing operation: The three basic filing operations are:

1) Straightforward filing: In this operation the file is pushed straight ahead across the work.

2) Draw-filing: This is an operation in which the file is grasped at each end, and with an even pressure alternately pulled and pushed over the work, the file remaining perpendicular to the direction of motion.

3) Lathe filing: This is an operation in which the file is stroked against the work as the latter revolves in a lathe.

Worker's stance: The feet should be placed well apart—the left foot being about 24 in. in advance of the right foot. The operator should have the full free swing of the arms from the shoulder. Any separate movement of the wrist and elbow should be avoided if possible.

Gripping the file: The following directions are for files to be operated with both hands. They are intended for a right-handed person, although they will apply equally well for a left-handed person when the file positions are reversed.

The handle of the file should be held in the right hand and the tip held with the left hand. Although the position of the left hand varies with the type of work to be done, the right-handed grip remains the same. The file handle rests in the palm of the right hand, with the thumb lying along the top of the handle, and the fingers curling

FILE FINDER FOR SPECIAL-PURPOSE FILES

CROSS-SECTION	NAME	SHAPE	CHARACTER OF TEETH	TAPER	GENERAL USES
	Brass	Flat Rectangular	Made in one cut only. Sharp teeth, with open cut.	Tapered	Filing brass, bronze, copper, aluminum.
	Brass	Half-Round	Made in one cut only. Sharp teeth, with open cut.	Slightly tapered	Filing brass, bronze, copper, aluminum.
	Aluminum	Flat Rectangular	Made in one cut only. Fast-cutting teeth.	Tapered	Filing aluminum alloys and other soft metals.
	Aluminum	Half-Round	Made in one cut only. Fast-cutting teeth.	Slightly tapered	Filing aluminum alloys and other soft metals.
	Lead Float	Flat Rectangular	Single-cut; coarse teeth.	Almost blunt	Filing lead, aluminum, brass and other soft metals.
	Lead Float	Half-Round	Single-cut; coarse teeth.	Slightly tapered	Filing lead, aluminum, brass and other soft metals.
	Foundry	Flat Rectangular	Short, stubby, sturdy teeth.	Tapered	Rough filing, castings, harder metals generally.
	Foundry	Half-Round	Short, stubby, sturdy teeth.	Slightly tapered	Rough filing, castings, harder metals generally.
	Long Angle Lathe	Flat Rectangular	Made in one cut only. Both edges safe.	Slightly tapered	Lathe work where smooth finish is desired. Also soft metals.
	Plastic File	Flat Rectangular	Teeth leave no serrations on plastic surface.	Slightly tapered	Plastics.
	Stainless Steel File	Flat Rectangular	Exceptionally sharp.	Slightly tapered	Stainless steels and high-chrome tool steels.

around the handle and pointing upward, all the fingers falling into a natural grip.

When the tip of the file is gripped with the left hand with the ball of the thumb pressing upon the top of the file and lying in line with the file axis, and with the fingers winding around the file, a powerful grip is secured that enables the maximum pressure to be applied and a large quantity of material to be removed. This grip is generally used with a medium or long file.

When a lighter stroke is wanted and less pressure is to be applied, the direction of the left thumb is changed more and more until it lies at right angles, or nearly so, with the length of the file. The tip of the file is then held between just the thumb and the first two fingers of the left hand.

For flat filing, the thumb and fingers of the left hand are stretched as far apart as possible and pressed evenly against the file. This assures a uniform distribution of the pressure over the whole length. As a result, the file tends to remain horizontal, and any unevenness in the surface can be readily detected. This position also permits the use of the file's full length, since the left hand is not in the way of the work.

For very accurate work, or when curved surfaces are to be filed. The tip of the file is held by just the thumb and index finger of the left hand, this grip allowing maximum guidance and control.

When the file can be held with one hand, as for example, in precision die work, the index finger of the right hand is generally placed on top of the handle so it lies as nearly as possible in the direction of the file. The thumb and other fingers fall into a natural grip.

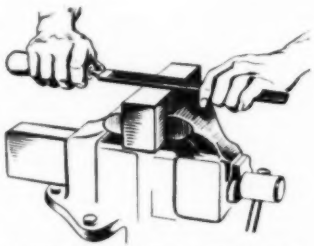
Filing a narrow piece: On work of this sort, it is often found easier to get and hold a flat surface if the file is held diagonally to the work. As the file is pushed forward, it is moved to the right from one end of the piece to the other. After a few strokes the process is repeated to the left so that an absolutely level, smooth finish is obtained.

Stroke and pressure: The teeth of the file cut only on the forward stroke. Accordingly, the file should be carried forward on an almost straight line, with the pressure first applied by the left hand at the beginning of the stroke; then later, with both hands equally in the middle of the stroke; and finally, with the right hand alone at the end of the stroke.

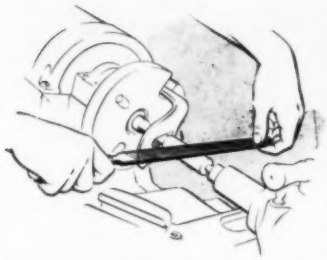
If pressure is applied on the return stroke, the teeth are dulled and the file quickly ruined. Except when working on soft metals, the return stroke should be made with the file lifted clear of the work. If too much pressure is employed on the forward stroke, the teeth are liable to clog or even to shell off. Just enough pressure should be applied to keep the file cutting efficiently.

It is well to remember that at the beginning of the stroke, the leverage favors the right hand and the file tends to round off the near side of the work. As the stroke is completed, the leverage favors the left hand and so the file is brought down harder on the far side of the work.

In this way the file tends to develop a curved surface instead of a flat one. This result may be minimized by carefully following the directions given above. With practice, patience and perseverance, it will be found possible to file a surface that is absolutely true and square.



Draw filing produces a smooth flat surface and requires an entirely different technique of file holding



Lathe filing employs the standard grip, but a special long-angle file is required. File must be stroked, not just pressed on the work

Beginners' faults: The main fault with most defective filing is that the beginner allows the file to rock or see-saw, thereby producing a convex surface instead of the level surface desired. To avoid this, the body should be kept still and the arms made to pivot about the shoulders. Also, the filer should not try to remove too much metal in one stroke. Take it easy.

Make sure the file is clean before starting. If dirty, it can easily be cleaned with a file card. When a new file is used, rub it with chalk to keep the teeth from clogging. Merely rubbing soft chalk over the teeth prevents the filings from getting wedged in the teeth. Chalking is also an advantage during finishing, as otherwise the pins are likely to scratch the work. Never use a file without a handle. Never use a loosely fitting handle.

Draw Filing

Draw-filing is defined as operating a file in such a way that its length is transverse to the direction of motion. It is employed where a smooth, level surface on planes or edges of the work is desired.

The file is held with both hands with the fingers on the edge away from the body and the thumbs on the edge toward the body of the filer. The file is alternately pulled toward the body, then pushed away, across the work with an even pressure. One advantage of draw-filing is that the file can be held steadily. As a result, a fine surface finish is obtained without scoring or scratching. Ordinarily a single-cut mill bastard file, or a long-angle lathe file should be used so the metal is cut with a true shearing or shaving action, and scoring is avoided.

If metal is to be removed rapidly or in comparatively large amounts, as for example, on the end of a metal plate or sheet, a flat or hand bastard file may be employed. This roughing down may then be followed by finishing with a mill file.

In draw-filing the beginner has a tendency to apply most of his effort when the file is in the middle of its stroke. In consequence, the surface is likely to develop a hollow spot. This must be guarded against by careful testing after filing. Such a hollow area may be removed by applying a few more strokes at the end of the work.

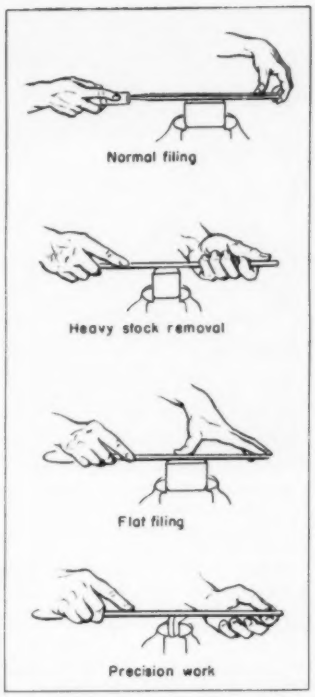
To remove the sharp wire edge that draw-filing produces on the work, hold the file at an angle and run it lightly down each edge.

Lathe Filing

If the lathe cutting tool has been properly ground and set for the proper speed and feed, most work that is finish-turned on the lathe is smooth enough as it is. No additional finishing is necessary. However, the work may sometimes have a slight taper that needs correction. Since another cut on the lathe may result in the work being made undersize, the correction can be made quite easily by a filing operation known as lathe filing.

Unless lathe filing is properly performed, it will do more harm than good. First, select a long-angle lathe file to give a true shearing cut without producing ridges or scores. Or, a single-cut mill bastard file may be used. The speed of the lathe should be increased to about 50% higher than that for regularly turning work of the same diameter. Be sure that the work is revolved toward the operator. Hold the file at a slight angle and use a long forward steady stroke, moving laterally about half the width of the file on each stroke.

Don't hold the file rigid or stationary, but keep continually stroking. Clean the file frequently with a file card or brush. Also, occasionally apply chalk to prevent pinning or clogging of the teeth.



Positions of hands is important and varies according to the type of work to be done. Principal change is in the position of the left hand

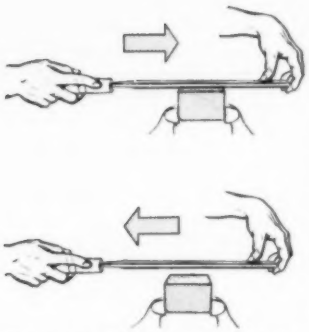
How to Take Care of Files

A file is a cutting tool. It should be treated as such. Unless it is properly respected and carefully handled, it will not give the service of which it is capable.

To enable files to give more and better service for a longer time, the following few simple directions should be clearly understood and carefully observed. Although these 15 basic principles of good file practice have already been discussed, they are assembled here as a handy summary for convenience and guidance of the operator.

Securely fasten material: When work is loose it permits chattering and distorts the tooth edges. Mount the work in a vise. Use protective pieces of soft metal between the vise jaws and the work in cases where the material may be damaged by pressure. In general, mount the piece to be filed at elbow level. If the work is heavy, it can be placed lower. If fine and delicate, it should be raised to eye level.

Select the right file: Don't be satisfied with any file that happens to be handy. The wrong file wastes time, effort, workmanship, and file life. Do not, for example, use a coarse file



Raising the file on the return stroke preserves the sharpness of the teeth and increases file life. Exception is on soft metals where dragging helps to clean the teeth

on fine work; nor a fine file on coarse, heavy work. Remember there is one type of file best suited for the job to be done, and that is the file you should select.

Mount handle properly: Do not hammer or pound the file in order to drive the tang into the handle. After selecting the proper handle, merely slip the tang into the hole, and then tap the handle on the bench until the tang is firmly seated. A file should always be fitted with the right handle. These are of six different sizes, from the smallest for use on a 3- to 6-in. file, to the largest for use on 16- to 20-in. file. Each handle is made from seasoned white birch, and fitted with a strong spun-steel ferrule that protects it against splitting and insures long life.

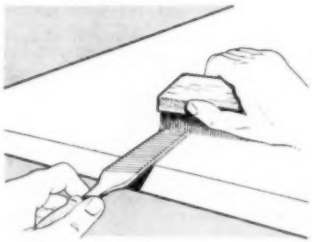
Use the correct pressure: Too much pressure causes excessive wear and is likely to damage the teeth. It is likely also to cause the file to clog, then to rub rather than to cut. On the other hand, too little pressure merely causes the file to slide across the work instead of cutting. Apply just enough pressure to keep the file cutting at all times on the forward stroke. Work with a speed so that the file does not slide or glaze. Use long, steady, uniform strokes. A fast or choppy stroke may chip the teeth. Remember that a new file bites into the work more readily than an old file, and should therefore be used lightly at first.

Work horizontally: Whenever possible the work should be arranged to permit the file to be used in a horizontal position. Filing upward or downward at an angle forces the hands and arms into unnatural positions and makes it almost impossible to produce a true surface.

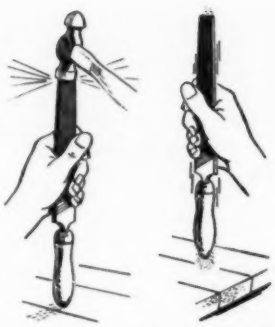
Watch the back stroke: Raise the file slightly during the return stroke on hard metals to clear the work and prevent the backs of the teeth from wearing. File teeth are designed to cut on the forward stroke. For this reason the pressure on the file during the back stroke should be relieved by raising the file slightly. When filing soft metals such as lead or aluminum, however, the file may be dragged lightly on the back stroke, as this aids in cleaning the teeth and avoiding clogging.

Keep file clean: You can readily do this at the end of every few strokes by tapping the end of the file on the bench. This loosens the chips from the teeth. Then, at periodic intervals, clean the file thoroughly with the file card. Under no circumstances knock the file against a vise or machine with the idea of removing the chips. It is obvious that this action will ruin the teeth—even break the file. A dirty file is a dull file. Many files are discarded as worn out, merely because they are covered with grease or their teeth clogged with filings. The file card should be brushed across the file so the wire bristles can pry out the chips. On coarse files, a pointed, soft iron pick can be used to advantage, while for fine files a stiff bristle brush is recommended.

Protect files when not in use: Keep files separated. Do not place or toss them into a drawer, on a bench, or among other tools. If you do, you will damage their keen cutting edges. The best practice is to keep files separate, either by standing them with their tangs in a row of holes in a file box, or by hanging them in a rack. In this way the files will be protected, yet still within easy reach of the workman. In the storeroom new files should preferably be left in their protective wrappings or original boxes and



Removal of pins (chips) should be done periodically with a proper wire brush (file card). Tapping the file against the vise will damage and perhaps break it



File handles must be seated firmly on the tang, but hammering the file (left) is dangerous and may break the blade. Correct method (right) is to tap the handle on the bench until tang is firmly seated

segregated by styles in a series of pigeon holes. Partitioned wood trays also afford good protection.

Keep files dry: Do not leave them in a moist atmosphere as they are liable to rust and rapidly become useless because the sharp cutting edges of the teeth will crumble away into powdery rust.

Chalk file teeth: Ordinary chalk rubbed onto the teeth of a file will make a fine, smooth cut by preventing pins from wedging between the teeth and scratching the work.

Saw-tooth filing: Select a file with sides twice the width of the saw tooth. In this way the full filing surface of the three sides of the file will be obtained.

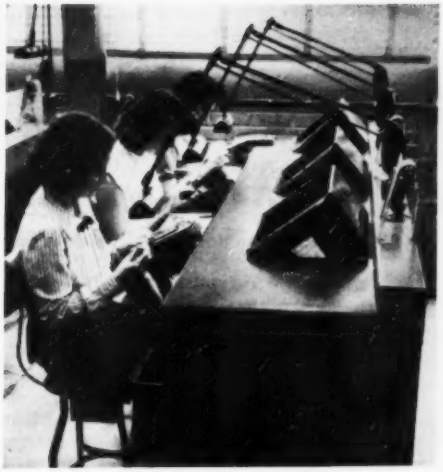
Remove the oil: In using a new file, remove the oil with which it is lightly coated. This will make the teeth cut more easily. Use chalk and a wire brush to remove the light oil film. Use of kerosene or gasoline introduces an unnecessary fire hazard. However, do not remove the oil when the file is to be used on fibrous material.

Draw-filing: Use a long-angle file, and hold it at right-angles to the work—moving it sideways over the work as previously described.

Iron castings: Remember that the hard spots and hard corners encountered are rough on files. They are quickly ruined by cast-iron scale and core sand. First go over such work a few times with an old file before attempting to use a good file.

Brass and copper: A very sharp file is required. After a file has been dulled on these or other soft metals, it will still be found satisfactory for use on cast iron, wrought iron, and steel.

Steel bench has universal fixture-mount at each of three work-areas. To this mount is attached proper fixture for completing ends of various precision coil springs. Parts easily tangled, are spread out in tray at left for easy grasp. After operation, chute holds springs until quality is checked, then carries them to totepans under bench



Working arrangement is comfortable for operator and permits motions that are short and fast. Because there is a definite place for supply, finished parts, and fixture, change-overs from one operation or job to another are easily made. There is no hunting for room to place totepans and no danger of poor setups

NEW BENCHES EASE WORKPLACE LAYOUT

BY C. M. BROMMER,
Methods Engineering Dept.
HUNTER SPRING CO. Lansdale, Pa.

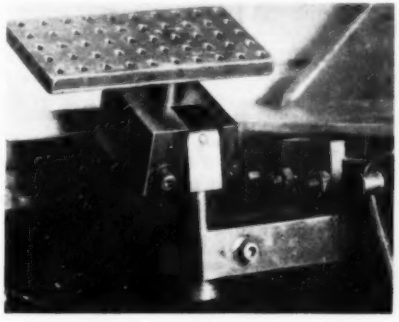
ARRANGING the workplace for a variety of fixturized operations is no problem at Hunter Spring. Recently designed workbenches provide an easy means of mounting fixtures, a place for both raw-material and finished-parts totepans, and a chute that not only permits drop-delivery, but also ties in with the plant quality-control system.

At the front edge of the benches, which are made of ⅛-in. welded steel, is a series of ¼-in. holes. These are used for bolting a universal fixture-mount to which any fixture may be attached.

To the left of the fixture, is fastened a specially designed chute into which parts are dropped as the operator's hand moves for the next piece. Parts slide to a totepan held directly beneath the bench in a frame made of ½-in. round bar. Raw-material pans are dropped directly into an opening in the surface of the bench.

At the end of the work-chute is a gate which stops the flow of parts into the totepan. Every hour, an inspector takes a sample to a central inspection department for checking. If the sample passes, the inspector opens the gate and moves the batch of parts into the totepan. If not, the segment of production held in the chute is removed and given 100% inspection.

These facilities also promote good housekeeping and safe working conditions by keeping the material off the floor around the benches, and by eliminating the practice of piling totepans on stools or any other handy object. Good motion economy is automatically made possible, and the bench lighting fixture is such that it can easily be adjusted to suit the needs of any particular operation.



Universal mount is movable about three axes so any one of several fixtures of varying size, shape, and height may be adjusted to best working position. Socket-head screws lock mount in position. Series of tapped holes are for attaching fixture to top plate of mount

HOW TO EVALUATE SOLDER EFFICIENCY

Careful tests made under controlled conditions reveal interesting data on the efficiency of various alloys for soldering

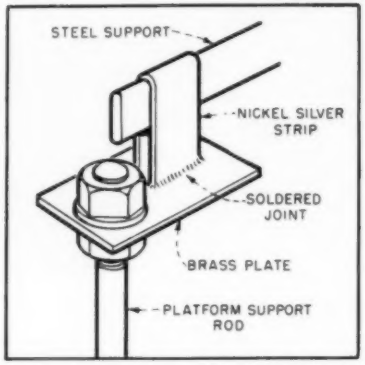
BY CLIFFORD L. BARBER
KESTER SOLDER COMPANY

ALTHOUGH soft solder has been known and used for hundreds of years, the actual soldering efficiency, or relative alloying quality of the various alloys, has never been subjected to quantitative experimental measurement. Numerous tests have been made on certain specific constants of various solders, but these tests do not reflect directly on the efficiency of the solder and cannot be interpreted in terms of actual solder quality. This article is an attempt to establish, by means of an empirical standard, some quantitative differentiating relationships between the normal alloying efficiencies of the various solder alloys.

How Solder Works

The principal quality of a solder is reflected most directly in the manner and extent to which it wets a metal, in a capillary manner, to form a completely metallic contact. Underlying this behavior of molten solder and inherent in this capillarity, appears to be a metal solvent action leading to the formation of an intermetallic alloy between the solder and the base metal; if this action did not occur there could be no soldering. Inherent further in this capillarity and mobility of a solder are certain chemical properties such as the behavior of its oxides under the influence of the flux; if these oxides are not capable of efficient coagulation and reduction, then the surface tension and mobility are adversely affected and the capillary action restricted. These inherent forces operating in the capillary climb or spread of molten solder on a metal being soldered, therefore, largely determine the character and quality of the subsequent joint made with it.

It is evident that the physical properties of a solder joint are necessarily quite different from those of the original solder and will vary according to the extent of alloy formation. A common source of error in the literature is the failure to recognize that any physical property of a solder joint is the product of many variable factors and will vary according to the manner in which these factors are permitted to function. Another common error is the correlation of solder quality with solder melting point; it should be emphasized that the mere fusion of some fusible alloy on a metal does not necessarily constitute alloy formation necessary for forming a joint.



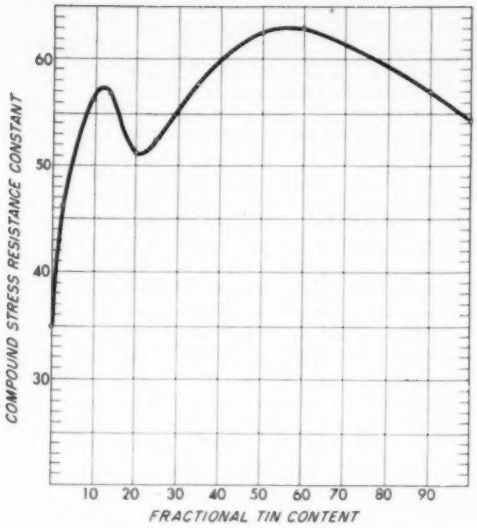
Simple apparatus for determining joint efficiency consists of a U-shaped strip soldered to a plate, and a rod from which weights are suspended

The quality of a solder joint is reflected largely in its resistance to certain types of strain and stress; the shear strength and creep resistance, which are important in the case of ferrous metals, are not particularly relevant in the case of solder. A porous, brittle joint, even though it might possess high shear strength and creep resistance, would still be an inferior joint according to the requirements of good soldering. The average solder user requires a physically homogeneous joint that provides a permanent and constant electrical value, that lends itself to relatively minor strains and stresses, and that resists shock or suddenly applied strain.

Any experimental technique deigned to test the quality of a solder, therefore, necessarily involves a procedure which covers not merely one or two specific properties of the alloy, but rather, as far as possible, all those properties that are conducive to its practical utility. An empirical experimental technique designed to cover the essential aspects of soldering as they normally operate, and capable of giving results reproducible within certain acceptable limits, has been developed for testing the relative alloying or soldering efficiency of solders.

Test Results

Results obtained by this technique and shown in the accompanying tables are based on the behavior of solder on two metals—brass and nickel silver. It is theoretically possible that different metals—for in-



Tin-lead solders show rapid increase in joint efficiency with tin content up to 15%. Further tin, up to 20% lowers this, and thereafter, efficiency increases to a maximum at about 60% tin

stance copper and steel—would have produced different results. Nevertheless there is an underlying consistency about the results that is very significant. The general shape of the alloy efficiency curve is about what would be predicted on the basis of metallurgical considerations and previous qualitative observation. Also the unanimously negative behavior manifested by the elements silver, antimony, bismuth and cadmium toward the alloy action of tin and lead can hardly be explained as a coincidence related only to brass and nickel silver; furthermore their behavior is strictly in accord with what careful qualitative observation would predict. In view of the consistent character of the results and their general agreement with theory and qualitative observation, the following general conclusions appear to be thoroughly justified.

When tin is added to lead there is a sharp increase in the efficiency of the alloy which reaches a first maximum at about 15% tin. Further addition of tin causes a sharp decrease in alloy efficiency with a minimum at about 20% tin. When more tin is added, alloy efficiency again gradually increases to a second maximum where the alloy contains 60% or more tin. Further addition of tin beyond 60% causes a slight but gradual decrease in the efficiency of the alloy. It is significant that the maximum efficiency points occurring at 15% tin and again near 60% tin, correspond to critical points in the tin-lead constitutional diagram where the alloy is most homogeneous. The alloy at 15% represents the solid solubility limit of tin in lead and the alloy at 63% represents the eutectic composition.

Addition of a small amount of silver to lead produces about the same effect as the addition of an equal amount of tin. Contrary to popular belief, a small amount of silver is not the equivalent of a large amount of tin; a 2½% silver alloy (Alloy No. 19) is about comparable with a 2½% tin alloy (Alloy No. 18). Since it is impracticable to add large amounts of silver to lead, it is impossible to prepare a silver-lead alloy possessing the soldering efficiency of ordinary tin-lead solders. It has been observed that in the case of tin-lead-silver solders, there is a sharp arrest in the cooling curve below the temperature of eutectic solidification, indicating a basic change in solid solubility with the possible formation of a brittle alloy, such as Alloy No. 13.

Antimony does not appear to impart any useful quality to solder; although antimony with certain restrictions might serve as a substitute for lead, it does not appear to be a substitute for tin. A comparison of the compound and multiple stress values of Alloy No. 7 with those of Alloy No. 8 indicates that antimony makes solder less resistant to strain. This would be expected in view of the known fact that antimony makes solder brittle. When antimony is added to tin (Alloy No. 2) the resultant alloy produces a stronger joint, but the same effect is obtained by adding lead. A 60/40 solder (Alloy No. 4) or even 50/50 solder (Alloy No. 5) produces just as strong a joint as 95/5 tin-antimony solder, even though these alloys contain scarcely more than half as much tin. In this sense antimony is again a substitute for lead but not for tin.

Cadmium fails to improve the efficiency of solder, as shown by a comparison of the stress resistance of Alloy No. 16 with that of Alloy No. 17. While cadmium might serve as a partial substitute for lead, it is hardly a substitute for tin unless the view is taken that the function of tin, in some instances, is to decrease rather than increase the efficiency of the alloy. Cadmium alloys oxidize quite easily and tend to form brittle, porous and uncertain joints, similar to Alloy No. 10.

Bismuth in appreciable amounts should be excluded from solder, as shown by a comparison of the stress resistance of Alloy No. 5 (50/50 solder) with that of Alloy No. 6 (50/50 solder with 14% bismuth). A further comparison of the multiple stress value of Alloy No. 13 with that of Alloy No. 12 indicates that even when present in small amount, bismuth is conducive to the formation of a brittle joint. The comparatively lower multiple stress value of Alloy No. 13 is however, presumably due in part to the influence of antimony and silver.

Summary of Test Results. The soldering efficiency of tin-lead solder is not strictly a progressive function of the tin content; there are maxima and minima in the alloy efficiency curve. Silver appears useful in solder, provided tin is completely unavailable. Antimony in small amounts and cadmium in somewhat larger amounts may be tolerated in solder but they seem to impart certain undesirable

physical properties to the solder joint. Bismuth in appreciable amounts should be excluded from soft solder. Neither silver, antimony, bismuth nor cadmium improves the effective alloying quality of tin-lead solder.

Experimental Procedure

The experimental procedure for testing alloy efficiency consisted essentially in soldering an inverted U-shaped metal strip to a flat metal sheet and then determining a specially applied force required to pull the strip from the sheet.

The plate was 1x1½-in. half-hard sheet brass cleaned with steel wool; the strip was 0.025-in. half-hard 18% nickel silver cleaned with steel wool and bent into a U with the sides ⅛ in. apart. For flux, 50% aqueous solution of $ZnCl_2$-NH_4Cl eutectic salt was used, with a little wetting agent. Tin was 99.93 to 99.97% pure Straits; lead, 99.99% pure electrolytic; and silver, antimony, bismuth and cadmium the purest commercially obtainable.

The solder alloy was prepared by fusing together the appropriate metals in the desired composition. Tiny solder ingots ⅛ in. in dia were then prepared by pouring in a small steel ingot mold. From these ingots, pellets were cut ⅛ in. long and ⅛ in. in dia.

An apparatus for determining the stress required to sever the soldered unit, consisted of a steel plate about 1 ft square suitable for holding 1-lb weights, with steel rods extending vertically upward from each of its four corners and converging to a single, centrally located, ¼-in. steel rod fitted at its upper end with nuts and washers. This platform was a weight-holding device, symmetrically arranged in such manner that when attached to the soldered unit, and weights added, it provided a vertically downward pull at the point of attachment.

A solder pellet of the alloy under investigation was placed on its side on a porcelain plate, then one of the U-shaped strips was forced down over the pellet until the two ends were flush with the round edge of the pellet, with the latter midway between the edges. The strip, gripping the pellet between its prong ends, was immersed in flux exactly ⅜ in. Due to the action of the wetting agent, a fairly definite volume of flux adhered to the assembly. The fluxed assembly was then placed on the plate in a vertical position so the strip was parallel with the long sides of the plate. For mechanical reasons, the strip should be placed somewhat near the end of the plate rather than in the exact center. At this point, the round edge of the pellets, the square ends of the strip, and the flat surface of the plate should all make perfect and simultaneous contact.

Joint Formation

The plate with its fluxed strip and pellet was carefully placed directly on a bath of molten fusible metal previously heated to about 130 C; and which, therefore, had a surface film of oxide. (One corner of the plate may be bent upward to facilitate handling with pliers or forceps.) Heat was applied to the bath until the pellet was observed to melt. The molten solder was thus in a position to exert its inherent fluid, capillary, alloy-formation, or oxide-reduction qualities that distinguish a good from an inferior alloy. In some cases, the solder melts but does not flow; in others, it melts and flows but does not wet or climb the metal strip; in still others, it flows and seems to wet the metal but does not alloy well with it or form a homogeneous joint. In any case, its behavior is strictly a function of its natural, inherent quality and is independent of any external, operational technique.

After the pellet was first observed to melt, the heating was continued without interruption until the bath temperature reached an additional 60 C. Heating was then discontinued and the bath allowed to cool until its temperature dropped to about 130 C. The soldered assembly was then removed, allowed to cool in air to room temperature, and carefully washed and dried.

After the soldered unit was cleaned, a ¼-in. hole was drilled in the plate exactly 0.31 in. from one edge of the strip in such manner that it would lie on the extension of a line midway between the original ends of the strip and parallel with them. The ¼-in. rod of the platform was inserted through the hole and the unit securely bolted to the platform; the strip was then hooked over ⅛-in. steel support and the platform allowed to hang freely in air. The suspended 6-lb platform now exerts a vertical downward pull on the soldered unit at a point 0.31 in. from the edge of the strip, producing a stress on the solder joint due to moment of bending. When 1-lb weights are placed on the platform at the rate of 1-lb each 2.5 sec, the relatively soft plate distorts somewhat, and a tensile component

COMPOUND-STRESS RESISTANCE CONSTANTS

ALLOY NO.	MATERIAL	MAX. BATH TEMP. C	AVERAGE	NO. OF TESTS
1	Pure tin	320	54.5	40
2	95 Sn–5 Sb	310	61.3	20
3	90 Sn–10 Pb	295	57.0	20
4	60 Sn–40 Pb	275	62.8	20
5	50 Sn–50 Pb	285	62.6	20
6	43 Sn–43 Pb–14 Bi	235	39.1	10
7	35 Sn–65 Pb	320	57.8	20
8	35 Sn–63 Pb–2 Sb	315	57.1	20
9	35 Sn–63 Pb–1.5 Sb–0.5 Ag	310	58.2	20
10	28 Sn–32 Cd–40 Bi	210	23.0	10
11	25 Sn–75 Pb	335	52.7	20
12	20 Sn–80 Pb	345	51.3	40
13	20 Sn–75 Pb–3 Bi–0.5 Sb–1.5 Ag	315	53.5	20
14	15 Sn–85 Pb	355	57.0	20
15	15 Sn–70 Pb–15 Bi	320	44.9	10
16	10 Sn–90 Pb	370	56.4	20
17	10 Sn–75 Pb–15 Cd	320	55.0	10
18	2.5 Sn–97.5 Pb	390	46.2	20
19	2.5 Ag–97.5 Pb	375	48.1	20
20	Pure lead	390	35.0	20
21	Pure cadmium	390	19.0	20
22	Pure bismuth	350	6.0	10

MULTIPLE-STRESS RESISTANCE CONSTANTS

ALLOY NO.	MATERIAL	MAX. BATH TEMP. C	AVERAGE	NO. OF TESTS
1	Pure tin	320	50.1	20
6	43 Sn–43 Pb–14 Bi	235	24.6	10
7	35 Sn–65 Pb	320	48.1	20
8	35 Sn–63 Pb–2 Sb	315	45.7	20
12	20 Sn–80 Pb	345	43.3	20
13	20 Sn–75 Pb–3 Bi–0.5 Sb–1.5 Ag	315	38.6	20

of stress is gradually imparted to the joint. When the solder joint finally breaks, there is a combination of stresses which cannot be evaluated in quantitative terms or in terms of any single specific property, but which may be considered to approximate the general type of complex stress to which solder is most often subjected in actual practice.

The number of 1-lb weights on the platform when the joint breaks, plus 6 due to the weight of the platform, may be called the empirical compound-stress resistance constant of the solder under investigation; this constant is, of course, purely an empirical figure that is an explicit function of a specially selected technique of soldering and testing and is useful only for comparative purposes. It should be emphasized, however, that the entire technique is selected in order to duplicate and approximate as closely as possible the normal factors inherent in solder that are most vital to the solder user and that most reflect the usefulness of the alloy.

If the applied stress on the solder joint is different from that just described, the breakage value will be different. If the strip is gripped in a vise at a point 1 cm from the plate instead of being hooked over a support, an additional strain will be imparted to the solder as the sides of the strip are bent completely together by the vise. The effect of the added strain is most pronounced in the case of brittle joints, which tend to crack when the strip is squeezed together by the vise. Empirical multiple-stress resistance constants, determined according to this technique, are generally lower than the compound-stress resistance constants, due in part to the influence of the added strain on the brittle character of the joint.

Arc-Welding Safety—Try These Rules:

IN a paper delivered to the National Safety Congress, W. W. Reddie of Westinghouse Electric Corporation's Welding Department suggested that welding is not a hazardous operation, despite much literature on the subject. Welding safety depends upon the proper attention to safety factors, such as . . .

Equipment

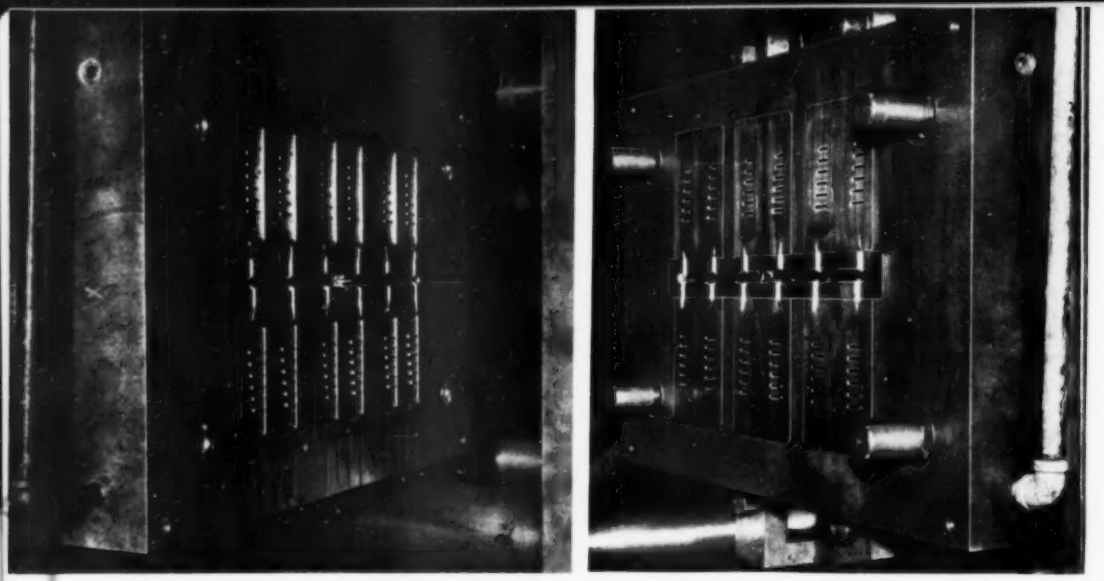
1. Keep welding and primary power leads clear of ladders, passageways, and doors. Keep leads to portable equipment out of aisles where they can be run over by trucks.
2. Keep power leads to portable welders away from welding cables and away from the welding operation so spatter cannot damage them.
3. Repair or replace defective cables and connectors immediately. Use locking-joint connectors with capacities as high as the cables.
4. Weld only when all connections are mechanically tight and with welding-machine frame grounded. Clamp the work securely.
5. Disconnect welding machine from power supply when it will be left unattended.

Personnel

6. Strike an arc only with light-tight shield in place.
7. Wear a skull cap; dry, unworn leather gauntlets; high - top shoes, sleeves and shirt pockets buttoned to keep out sparks.
8. Weld in a dry place with dry equipment except when supervision authorizes other conditions.
9. Inspect all personal equipment before welding.
10. Treat all electrical circuits with respect, and insulate your body with clothing wherever possible.
11. Weld with a fully insulated electrode holder and remove stubs only when your body is not touching the work.
12. Weld in confined places only when extra ventilation is available.
13. Provide extra ventilation when welding or cutting brass, bronze, galvanized steel, cadmium-plated steel, or metals coated with lead- or zinc-bearing paint—do not breathe the fumes.
14. Put holders aside in places where they will not contact other holders or workers.

Fire Prevention

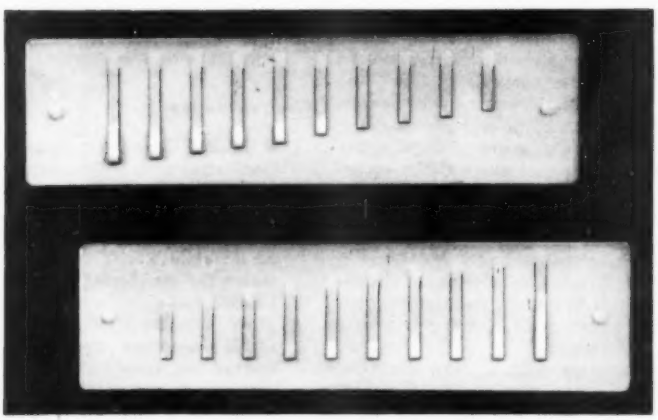
15. Weld only in properly authorized areas with a fire extinguisher readily available.
16. Remove combustibles from the welding area, or post a guard for 30 minutes after welding to watch for smoldering fires.
17. Discard stubs into metal cans.
18. Weld containers after flammable materials have been washed out, and fill them with water up to the welding level. Remove fuel tanks from equipment being welded or cover them with asbestos.



Pair of dies for injection molding of harmonica reed plates. Tolerance on finished parts is held to 0.0002 in.

PLASTIC INJECTION DIES MADE TO TENTHS

By holding tolerances on dies within 0.0002 in., Magnus Harmonica Corp. produces reeds accurate to one hundredth of a semitone directly from the die



Blow and draw reed plates each have ten individual reeds which must vibrate at the proper frequency without individual tuning

BY H. E. LINSLEY
ASSOCIATE EDITOR

CONTAINING no metal whatever, an all-plastic harmonica is being produced by Magnus Harmonica Corp. through the use of an interesting new technique of polystyrene injection molding.

The process, believed to involve the closest tolerances in the history of plastic molding, was developed during three years of research by Finn H. Magnus, and finally perfected in 1944.

Most critical part is the reed plate, a narrow strip of plastic having a series of small rectangular openings. From one edge of each hole a small tongue, the reed, projects over the opening and is free to vibrate when pressure or suction is applied. Each reed is of a different length and thickness, and each must vibrate at a certain rate to produce the correct musical tone. Average thickness is 0.020 in., but reeds for the higher notes taper down to as little as 0.012 in., while those for the lower notes are weighted at their free ends.

With metal instruments of this type, conventional practice has been to blank and pierce the plate,

and rivet the individual brass reeds in place. Then each reed is individually tuned by filing in various places until the operator's ear indicates the proper pitch. With the integrally molded plastic reed, tuning is done in the die itself, and with properly controlled operating conditions the complete molded unit requires no additional tuning.

A standard die produces six pairs of plates, one draw and one blow plate to a pair, and each impression is individually made and inserted into the main die block. Cavities are hubbed into the die, which is of chrome-nickel steel, subsequently hardened to Rockwell C 60. Male parts are roughed out by milling, and hand filed and finished. Each reed must be an exact amount narrower on each side than the corresponding slot in the plate, and each male projection on the die must fit exactly on all four edges into its corresponding cavity. Thus, in a typical die there can be as many as 864 contact points requiring a perfect match, and a total of 528 separate inserts, including the knockout pins. Tolerance anywhere in the die is practically nil.

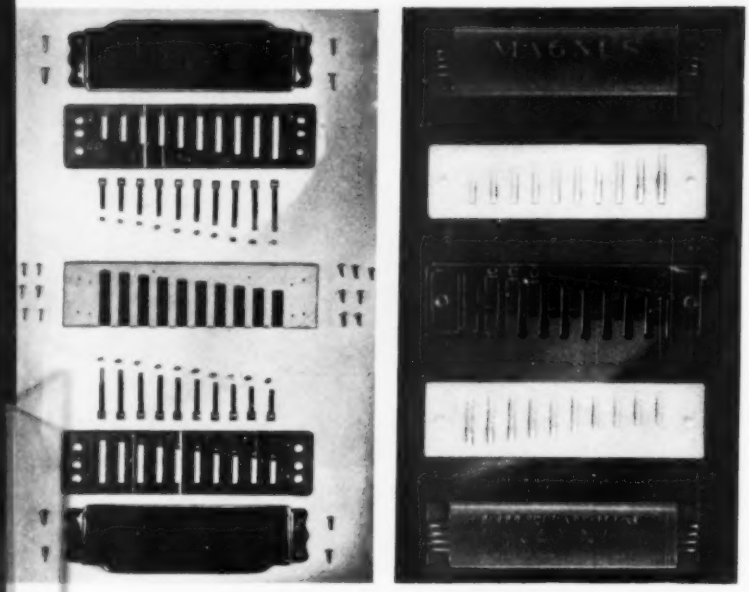
After a new set of dies is made, a set of plates is produced for checking purposes. Each reed is examined on an optical projector for side clearance and under the microscope for form and sharpness of edges, blown by compressed air or vacuum for checking the rate of vibration under a Strobotac, and finally blown by mouth against a microphone pickup which is coupled into an electronic stroboscope. The latter instrument has a series of twelve windows corresponding to different notes in the scale, behind which patterned disks rotate. When the tone is correct the pattern becomes stationary and a meter indicates the amount by which the reed is out of tune in hundredths of a semitone. If the die is not perfect at this point, corrections are then made. Experience is the only guide in this matter.

The die is then hardened in a controlled-atmosphere furnace to

Microscopic examination of reeds reveals their condition and is an important part of the intricate diemaking procedure

Optical comparator checks side clearance of reeds which must be an exact amount narrower on each side than the corresponding plate openings

Electronic stroboscope checks musical tone within a hundredth of a semitone. All tuning is done on the die so parts can be used as cast



Conventional instrument, left, requires 67 individual parts, and metal reeds must be individually tuned. Skillful use of plastics, right, reduces parts to five, and reeds are molded in tune

avoid the formation of scale, and is ready to go into production. Approximately 6 mo are required to produce a set of dies, but their life expectancy is extremely high. One set has been in continuous operation for over 3 yr and has undergone several million shots with only moderate signs of wear, necessitating only infrequent overhauls.

Standard Reed-Prentice injection molding machines are used. Die heat is controlled within ± 1 F by electronic pyrometers, and a specially designed feeding arrangement has been incorporated.

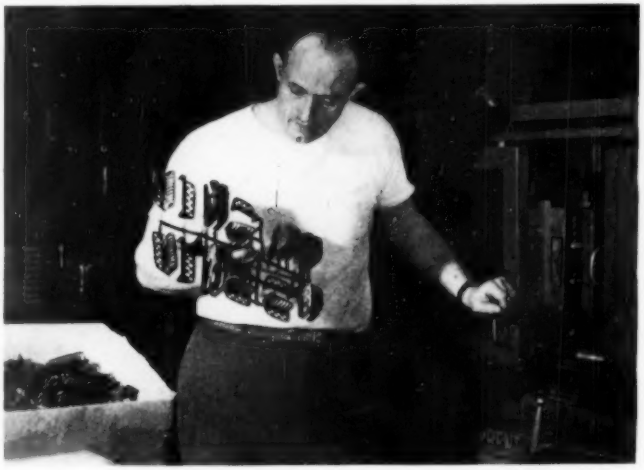
No flash is tolerated on any part; first, because, on the reeds, it would destroy the accuracy of the tone, and second because its removal would involve an additional operation. The fit of the various parts of the dies insures freedom from flash when the dies are properly closed.

So critical is the reed plate that as each piece is removed from its gate it is checked for thickness with a dial indicator gage to ±0.0001 in., and if parts are found to be running high or low, the operator removes or adds molding compound. If the condition persists, appropriate adjustment is made in the feed mechanism.

In addition to the reed plates, the other plastic parts of the harmonica are the upper and lower covers and the centerpiece, or comb. This latter has a central fin between the teeth of airfoil section to provide the correct ratio of pressure or suction, according as blow or draw reeds are being played. The five parts are assembled in simple toggle-clamp fixtures. One cover is pressed lightly against a pad moistened with a solvent and placed in the fixture; a reed plate is placed on this, and then the comb, moistened with solvent on both sides, is added. The second reed plate and cover are then positioned and the clamp closed. A second instrument is assembled in another fixture, by which time the first is ready for removal and inspection. Finished instruments are automatically wrapped in cellophane and boxed.

Cover plates and combs, as well as end plates, keys and keyboards for plastic accordions are made by similar methods, and although limits are not held quite so close, mating parts must fit without interference or excessive play, and flash is avoided. Gates, runners, and any reject parts are ground up and reused in production of non-critical parts.

This precision opens a new field in plastic molding and should have wide possibilities for other uses.



Keyboards and handles for two different sizes of accordions are produced in a single set of dies to exceedingly close limits

Special Cutters Mill Filleted Keyways

Double the life is secured from marine shafts if sharp, internal corners are avoided in keyways

BY W. F. BURCHFIELD
Asst. Director, Technical Service Section
INTERNATIONAL NICKEL CO.

KEYWAYS with filleted corners are generally recognized to be superior to those with square corners. Sharp corners are focal points for stresses, and fatigue cracks may develop under shock loads.

Tests on monel shafts with keyway fillets with a radius equal to about half the keyway depth indicate they will stand about twice as many impact blows as a sharp-cornered keyway before failing.

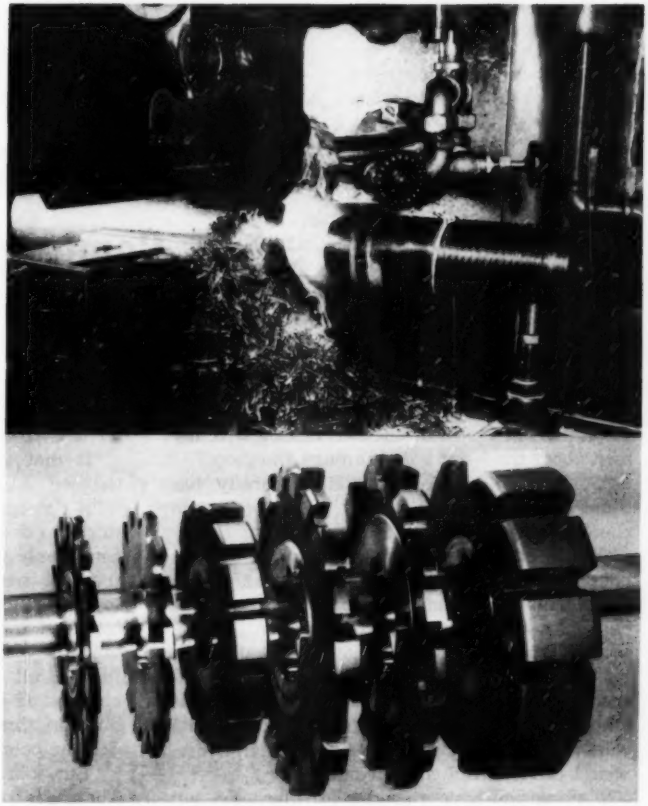
Fillets have been specified for some time in Navy standards for PT boats and in American Bureau of Shipping requirements for propeller shafts of vessels built under their surveillance. But they have not been widely used on other shafts because of machining difficulties.

Special cutters are now available from several manufacturers for milling filleted keyways. Solid form cutters with eccentric relief are available with the specified radius on the corners. In addition, split cutters are available in two types: Interlocking cutters have two sections so that, when the cutter is reground, shims can be inserted to retain the proper width. Because of the interlocking teeth, the expanded cutter continues to cut the full width of the keyway. In the other, or non-interlocking, split cutter, a space is left between the tooth sections when they are built out with shims.

All of these cutters are for horizontal milling. This method is preferable because it produces keyways with sled-runner ends — stronger than sunk-type keyways.

Good practice is to cut the keyway down to the beginning of the fillet with a square-tooth cutter, then mill the remainder with the form cutter. With interlocking and split cutters, a gashing cut to the depth of the keyway should also be made before milling the radii. Gashing cutters should have a 10 to 15° rake angle and enough peripheral and side relief to avoid dragging. After solid form cutters have been reground a few times they will be narrowed so that a second cut will be required to produce the right width.

When milling keyways in monel shafts with high-speed cutters, speeds should average 50 to 65 fpm. Feeds may be up to 0.010 in. per tooth, depending on depth and width of cut. Average cuts are about ⅛ in. deep and should rarely exceed ¼ in. Work should be flooded with coolant.



Form cutters for milling filleted keyways: Non-interlocking split cutter (left), solid cutter, interlocking split cutter, and another solid cutter

Suggested Radii for Filleted Keyways

SHAFT DIA., IN.	FILLET RADIUS, IN.
¾ to 1⅛	1/32
1¼ to 2	1/16
2¼ to 2¾	3/32
3 to 4	1/8
4½	5/32
5 to 5½	3/16
6 to 6½	7/32
7 to 8	1/4

NOTE: Other dimensions will be found in SAE standards for marine propeller-shaft ends and hubs.

ROUND TABLE

Can Engineers Come Into the Shop?

"Al, here's a new one that gets me seeing red! Thomas, the draftsman, has been spending a lot of time at one bench or another, talking with my men about the work going through the shop."

"So what?" laughed Al. "He naturally has some interest. Does it do any harm for him to check things as they are being done?"

"That's all very well, Al, if that was all that's being done. But he makes changes, adds new ideas. This thing is made stronger and that thing he thinks will be better if it is smaller. To tell you the truth, Al, it's getting lately so that I don't know a thing about how matters stand! As toolroom foreman, I give a man a job; then Thomas takes over again. I think I should be called into conference when any changes are made. Otherwise I can't control costs or output."

"I think you have a good point there, Ed, but are these things so vital they materially affect you as foreman?"

"How the Sam Hill am I to be up to date on the various jobs if I'm left in the dark as to what's going on?"

"But then again, Ed, as you said to me before many a time, to be relieved of a few details helps you out considerably and lets you put your time on more important things."

"What's more important than being able to know just what's being done?" frowned Ed. "First thing you know some wise guy's going to make a crack such as: 'Ah, what the Hell's he know about it?' and then I'm really going to blow my top."

"Is that the only thing you are afraid of?" laughed Al.

"No, it isn't, Al; there's another angle. Well, to get to the point, I'll give you a case that happened only this morning: I went up to Brown, thinking that his job was about finished. I started to explain to him something about the new job I intended to give him. Al, I was dumfounded when he told me that he practically had to make the job all over again on account of so many changes. If I'm going to have any control over my men, things like that can't happen very often. See the point?"

"But jobs are made better as a result of it. Thomas is fixing things before they get out on the production line."

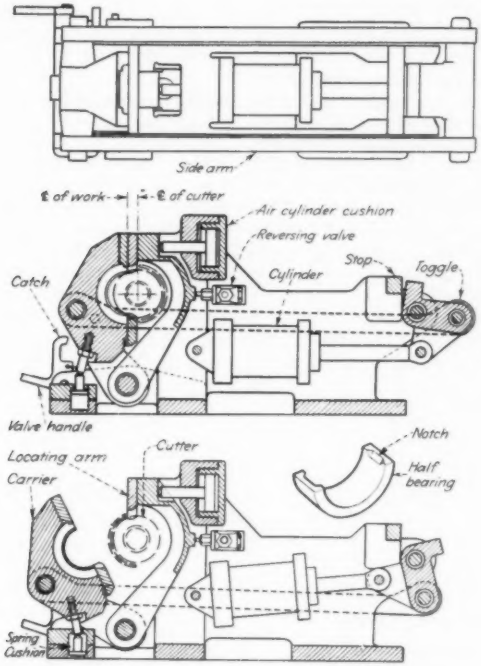
"But why doesn't he do his thinking when he's making the drawing? If he'll draw 'em right, I'll make 'em right. First thing you know, I'll tell that guy that whenever any changes are made that they should be made through me. He can keep his snoot out of my shop!"

"You're loading yourself up again, Mister! And you're throwing your weight around, I see. Afraid of your authority?"

"Well, who's got it—Thomas or me?"

***SHOULD THE ENGINEERS** stay out of the shop—or can they work with shopmen to the betterment of designs? How can it be done without dividing authority? Your opinions and ideas will help others. Discussions of earlier topics appear on later pages.*

Practical Ideas



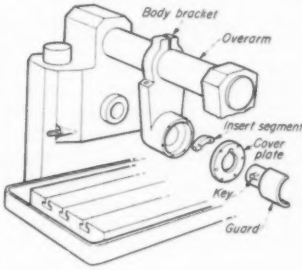
Safety Devices on Hand Miller Permit Semi-Automatic Cycle

A MILLING GUARD and fixture I recently designed employs tooling on a Kent-Owens hand milling machine that makes a production machine out of a simple machine tool. Operating power, aside from the 1-hp. motor in the machine which runs the spindle, is from air-line pressure.

The mechanism consists of two parts—a cutter guard to protect the operator's hands during loading and unloading, and an operating fixture which holds the work and feeds it into the cutter, which is fixed.

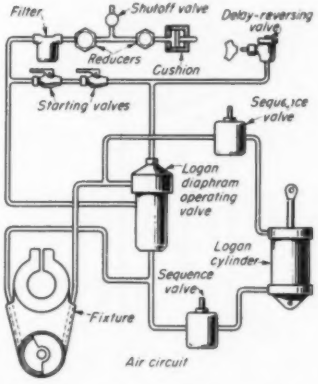
Two oil-bleeder notches are milled on both halves of an engine bearing, with the ends of the half-bearing being fed into the cutter. The cutter's diameter is more than the inside diameter of the bearing, so the cut is deep at the bearing edge and tapers out toward the inside of the bearing.

The cast-iron body bracket is clamped on the miller overarm and the remainder of the guard assembly, the arbor and the cutter



are assembled into the spindle nose. An insert segment cuts off air from the top section of the chamber formed by the assembly so the guard can move in only one direction when in either open or closed position. The guard itself is assembled through a cover plate which is bolted to the bracket after the insert is positioned and the guard has been turned to one side of the insert. A key on the guard piece is acted upon by the air to rotate it like an air piston. Pressure on one inlet closes the guard, and pressure through the other inlet opens the guard.

The fixture is operated by an air cylinder which turns a toggle joint at the right end. This pulls two side arms which swings the nest and carrier up to the cutter. A preloading cylinder behind the right



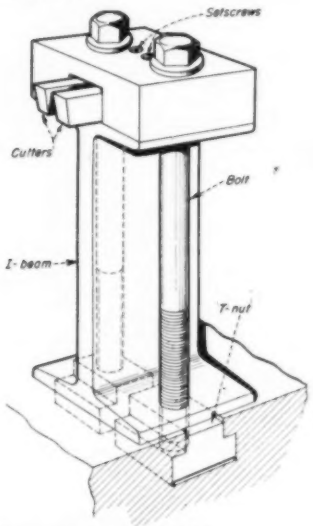
jaw of the clamp forces the locating arm out slightly, and as the carrier arm comes into position it forces the locating arm back against the cylinder, which acts as a cushion. This action also trips a time-delay reversing switch which reverses the air action after a slight pause during which cutting takes place. A spring cushion under the carrier arm prevents shock when the arm returns to the open position.

The air cycle is controlled

through a Logan sequence valve so the guard rotates to open position before the cylinder operates the fixture to feed in the work. The guard closes over the cutter just after the fixture clears it after the operation is completed.

An additional safety feature is the two starting valves which are in series—both must be depressed to operate the fixture, which occupies both the operator's hands. One of the valves is on the rear of the fixture and has a catch which locks on the fixture and prevents accidental operation until both valves have been tripped.

The half-bearing is held in the carrier arm by a clamp at the bottom of the part and is located by the locating arm at the top when the fixture closes. Air loss in the guard mechanism is slight, and with pressure over 20 lbs the action is snappy. *Glenn E. Shopbell, Dayton, O.*

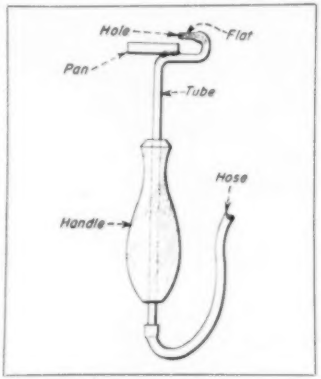


Inexpensive Toolholder Increases Cutter Height

TOOL BLOCKS for grooving or turning cutters can be considerably increased in height by the method illustrated. Simply yet rigidly constructed, the blocks can be employed on either front or back cross-slides of most turret lathes and screw machines.

A standard, wide-flange structural I-beam of the desired depth is finished parallel on top and bottom flanges. A rectangular piece of cold rolled steel is milled out for the two cutters, and holes are drilled and tapped in the top for holding setscrews.

Two larger holes are drilled directly through this piece and both flanges of the I-beam to receive the hold-down bolts. This arrangement secures both the block and the beam section directly to the slide. *Roger Isetts, Kenosha, Wis.*



Small Soldering Torch Burns "Canned Heat"

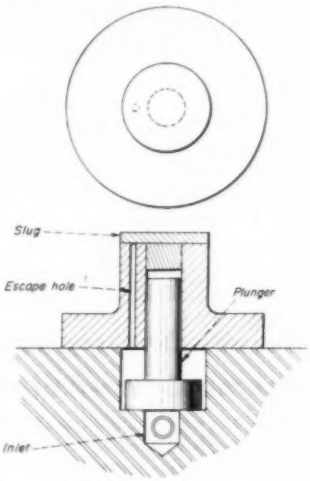
LIGHT SOLDERING EQUIPMENT is often not available in shops that produce large work, but small repair jobs, especially on instruments and precision hand tools, require something less clumsy than a large iron or a blow-torch.

A torch for small work was made to utilize "canned heat," which is available in grocery stores. A 6-in. length of brass tubing with a $\frac{1}{8}$-in. diameter was fitted at one end with an old handle from a small file, and the other end was gently hammered flat for about 3/16 in. This end was then bent into the hook shape shown, with the flat portion vertical, and a fuel reservoir, a discarded tin-can cap, was brazed to the tubing.

The flattened end of the tubing was drilled with a No. 60 drill to direct an air stream over the fuel. A length of automobile-windshield-wiper hose was attached to the lower end of the tubing. "Canned heat" about the size of a nickel was placed in the pan, lit and the operator placed the tubing in his mouth to control the jet of air while one hand directed the torch with the pan kept level. *George Burnley, Oakland, Cal.*

Bent Files Made for Unusual Jobs

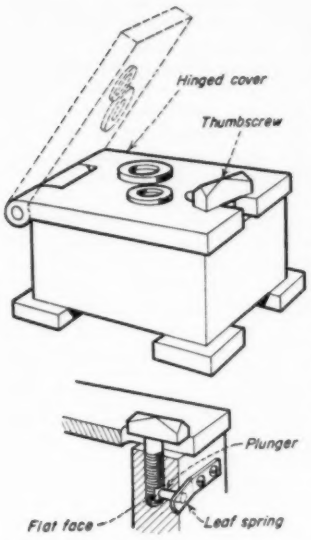
FILES can be bent for particular jobs where radii and curves must be filed and finished. The file of the proper grade is chosen and is heated until red hot. The required bend can be made, and then the file is reheated and quenched in brine. *Norman W. Wyckoff, Verona, N. J.*



Press Ejector Works on Air-Line Power

PARTS routed from a screw machine to a press for trimming are ejected rapidly with an air-line hookup. The air line is attached below the die and admits air for a double-action cycle.

The small plunger is first forced up by air pressure. This raises the part, after the trimming operation, only slightly. As the air lifts the plunger, it escapes around it and blows up the small hole in the die, hits the part off center, and tumbles the part out and off to the rear of the die. *A. C. Good, Dayton, Ohio.*



Spring Plunger Aligns Screw

FLAT-HEAD THUMBSCREWS which tighten down on hinged plates on fixtures can cause plenty of trouble when they must be aligned with slots in the plate so the plate can drop. These screws can be aligned quickly if a hole is drilled in the fixture to intersect the tapped hole, and a plunger is mounted on a flat spring screwed to the body of the fixture. A flat face can be ground on the threaded part of the screw, near its bottom, so that when the plunger snaps in to rest on this face, the head is aligned properly so the plate can be lowered. *Kinson Kwauk, Newcastle-on-Tyne, England.*

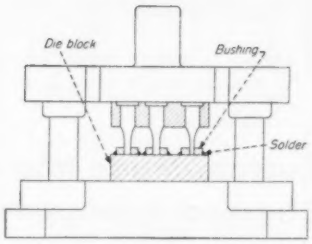
Screwdrivers Ground Concave

MAXIMUM STRENGTH at edges and corners of screwdrivers can be maintained by grinding them concave on the ends and both faces. This forces the edges of the drivers to bite into the screws and limits the tendency to lift out of slots. The technique also retards wearing down of the edges to the point where they become rounded off and it is nearly impossible to loosen a tight screw. *Orville O. Kilbourn, Montebello, Cal.*

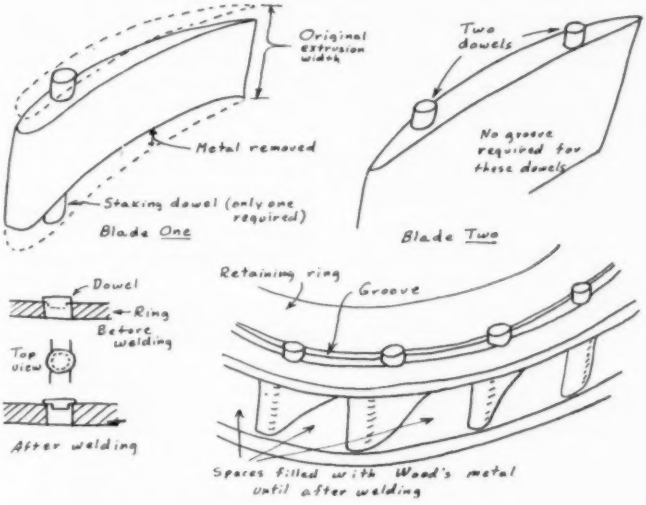
Soldered Bushings Locate Punch Holes in Die Blocks

THIS METHOD of locating punch holes in die blocks is used in our shop continuously and has proven to be an enormous timesaver. It eliminates a great deal of setup time and jig-boring time required to locate the holes properly in the die block with the necessary amount of clearance.

Bushings are made to fit over the cutting edges of the punches with a sliding fit. With the punches properly located in the punch holder, the top shoe is brought down until the punches just contact the die shoe. The bushings are then soldered to the die block, the punch holder is removed, and the die block is set up on a drillpress table for drilling the block.



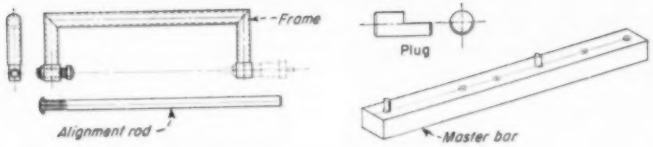
Holes are drilled through the block with drills the exact size of the punches to be installed. Then a larger drill, with its size determined by the clearance desired, is run through the holes and the run through the holes. The bushings are removed from the die block by melting the solder and cleaning it off the die. *Paul E. Wasser, Kankakee, Ill.*



Extrusions Make Blades

TURBINE BLADES for the new two-stage, torque-converter, V-drive on GMC diesel coaches are extrusions, cut to length plus stock for dowels turned on each side. Blades are sandwiched between two rings and held in position with Wood's metal; then the dowel ends are heated in a Progressive welder, upset and welded into the rings.

When only one dowel can be used, riveting is done into a groove so the blade cannot twist, because efficiency depends on accurate positioning of the blades. Dipping the assembly in hot oil melts out the low-melting-point alloy after the welding has been finished and the dowels are tight. *Chester S. Ricker, Grosse Pointe, Mich.*



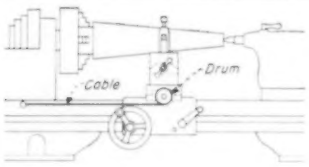
Custom-Made Micrometers Checked Against Pin Bar

WE LICKED the problem of maintaining interchangeability of parts up to a 70-in. diameter without investing in several large-size micrometers. Anticipated production of each part for replacement was five over a five-year period; and actual dimensions did not have to be close, as we made matching parts, but the replacements had to be within five thousandths of the originals.

A master bar of hot-rolled mild steel was planed on all sides to a 2x4-in. section and was drilled and reamed for 1-in. plugs made from hardened and drawn drill rod. These were pressed into the holes to provide standard settings for the micrometers.

Five frames were welded together from steel tubing. Angle or channel was not employed because of distortion during welding. Clearance under the main arm was kept low to prevent spring. After the anvil sleeve had been silver soldered to the frame, a threaded alignment rod was assembled to it to hold the micrometer sleeve while it was soldered to the other end of the frame.

A micrometer barrel was calibrated for each frame to read .5000 on its corresponding plugs on the reference bar by adjustment of the anvil. Although the micrometers could distort during the five-year period, they could easily be recalibrated at any time by reference to the bar. *Robert A. McCloud, San Lorenzo, Cal.*



Drum and Cable Turn Taper

TAPER-TURNING if the taper is small (under 2°) can be done without offsetting the tailstock or without a taper attachment. Mount a small drum on the cross-feed screw shaft. Fasten one end of a cable to the drum, wrap a few turns around the drum, and attach the other end to the frame or bed of the machine near the headstock.

As the saddle feeds longitudinally under power, it will cause, through the drum and cable, the cross-feed to turn.

The circumference of the required drum is the length of the part divided by the number of turns required to feed the slide in. This last can be best determined before the drum is assembled. *Wendell H. White, Oakland, Cal.*

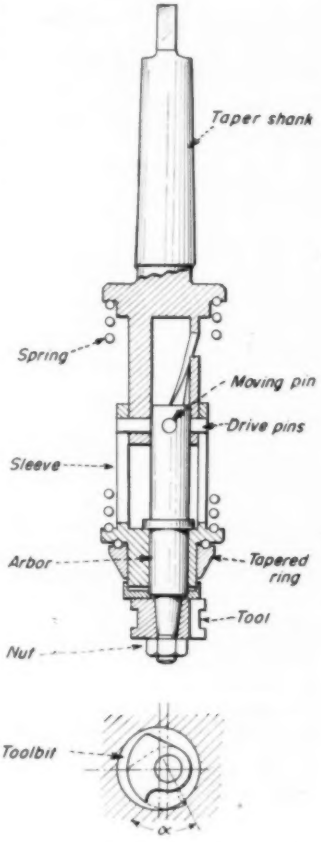
Grooving Tool Mounts Off-Center Cutter

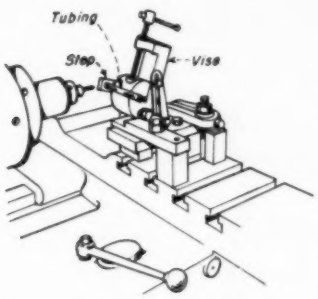
WE HAD TO DRILL a large number of 1-in. holes and cut grooves in their walls on a radial drill. It was desirable, for accuracy, to do the two operations at one setting of the drill, so a special tool was made to fit, by a Morse-taper shank, into a quick-change chuck held in the drill spindle. This was assembled right after the hole had been drilled and the drill removed.

By means of two drive pins set in holes in the shank and riding in vertical slots in the sleeve, the sleeve was provided with rotational motion. A tapered ring was fitted to the lower end of the sleeve to catch on the edges of holes and to center the tool. Small balls between the ring and sleeve reduced friction so the sleeve could rotate and the ring could hold stationary as the shank was forced down against the spring pressure.

An arbor, to which was bolted the cutting tool, was mounted in a hole in the sleeve that was off center. A moving pin through the arbor ran in two curved slots in the shank, so that when the tool was forced into the hole, the sleeve rode up on the shank, causing the arbor to rotate as the moving pin rode in the slots. This turned the tool and exposed the cutting edge to the work.

Mounted on a tapered section of the arbor, the tool could be adjusted after grinding to the proper position so that it would cut to the right depth. *L. J. Visser, Vlaardingen, Holland.*



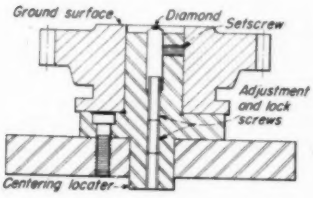


Milling Job, Switched to Lathe, Is Speeded Up

SETTING UP a milling job on a turret lathe licked a backlog problem in our machine shop. The operation consisted of cutting two longitudinal slots in short lengths of tubing, so a Jacobs chuck was adapted to the lathe spindle to mount a two-lip end mill.

A machine vise on a hinged base was shimmed up and clamped to the cross-slide and was adjusted to an angle that allowed both inserting the parts and operating the vise screw. This held the tubing perpendicular to the cutter. Stops on the slide and saddle positioned the work longitudinally, and the saddle was fed toward the cutter.

The lathe spindle was heavier than that on the mill, so higher speeds and feeds were possible, and the work was done faster. This setup also relieved a heavy load on our mills. *Aaron H. Shum, Burbank, Cal.*

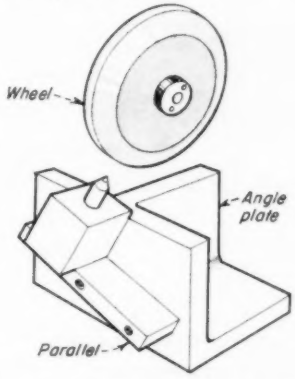


Grinding Fixture Holds Both Work and Dresser

GRINDER-SETUP TIME can be cut drastically by this type of fixture, which is suitable for a surface grinder. The fixture mounts both the work and a diamond-point wheel dresser at the same height.

Setscrews locate and clamp the dresser, and a ground shoulder on the hardened fixture positions the work. The diamond is adjusted by a surface gage from the face of the table. A drive pin, not shown, locks the part in with the fixture.

With the dresser set at the correct grinding height, the wheel is dressed and locked at that height. The part is dropped on the fixture and the table is fed under the wheel again. *Stanley R. Welling, Racine, Wis.*



Diamond Shapes Wheel Angle

SINGLE OR DOUBLE angles required on grinding wheels can be dressed with an angle-plate setup that is simple and accurate.

A parallel bar is bolted to the face of a heavy angle plate at the required angle, and the dresser, mounted in a plain block, is moved back and forth along the parallel to shape the wheel. The block is held by hand against the plate so it will not tip.

Two angles can be dressed on the wheel if two parallels are mounted on the plate in the shape of a V. These angles can be set with a protractor, or if high accuracy is required, with a sine bar. In either case, the face of the angle plate must be perpendicular to the plane of the wheel, or parallel to the spindle. The grinding wheel should rotate into the diamond so as to force it against the angle plate for stability. *Arnold Gamalsky, San Diego, Cal.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

74th Winner:

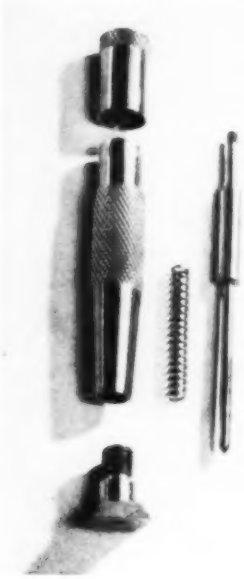
THOMAS PATELL
Paraffine Lubricates Bandsaw

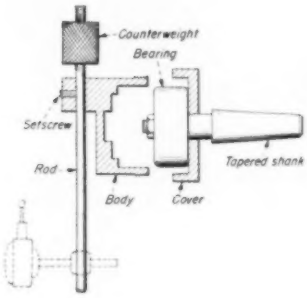
Indicating Lines Locate Centerpunch on Layout

SCRIBED INTERSECTIONS are centerpunched precisely with a spring-loaded punch that incorporates guide lines on its tip and eliminates the need for a magnifying glass. The assembly consists of a shouldered punch, barrel, retaining cap, spring, and a squared indicating tip.

The spring, which seats on the tip, holds the punch up from the work surface until it is hit with a hammer. This eliminates any unnecessary dulling action. A shoulder on the punch centers it inside the barrel, and a thread on the end is screwed into a tapped hole in the retaining cap.

Indicating lines on each face of the tip are aligned with layout intersections to center the punch exactly. The hardened tip can also be aligned by locating the four corners over intersecting lines. *Charles Buchalter, Grand Central Post Office, New York, N. Y.*





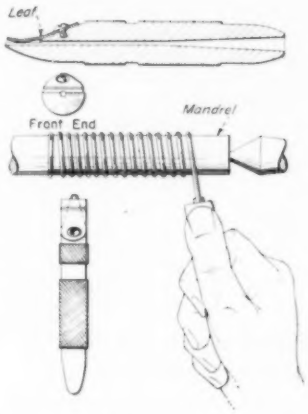
Centering Device Locates Shaft in Steadyrest

CENTERLESS SHAFTS set up in a steadyrest can be quickly trued to center if the illustrated device is mounted in the tailstock spindle of the lathe.

The body of the device is fitted with a bracket through which a hole is drilled and in which a rod is locked by a setscrew. The rod is threaded at one end for a knurled counterbalance which offsets the weight of the dial indicator mounted on the other end of the rod.

A Morse-taper spindle mounts a double-row ball bearing, which is held to a shoulder by a nut, and also holds a cover which screws onto the body to close over the bearing.

The indicator (dotted) is mounted at the end of the rod with its spindle toward the center and its face out. Careful truing will line up the shaft exactly with the centerline of the tailstock. *Samuel C. Smith, Roxbury, Mass.*



Wire Guide Grips Stock For Quick, Accurate Winding

ANY SHOP has a number of springs to wind once in a while, and many of them must be specially made for single jobs. This guide will speed the jobs and increase accuracy.

A piece of tool steel is drilled through and opened up at one end with a tapered pin. The guide is milled or shaped away at the other end so a spring-steel leaf can be assembled to it. The body is knurled to provide a good grip.

The guide can, of course, be made for any range of wire sizes, but the cut-away must be deep enough at the leaf end so that the smallest wire size to be wound can be gripped with thumb pressure on the leaf. *Lowell F. Stull, Youngstown, O.*

Scrap-Steel Bushing Helps Drill Spring Steel

SPRING STEEL, if it is quite thin, can be perforated by drilling the required hole in a piece of scrap steel clamped to the drillpress table. The drill is then reversed in the spindle and its shank is punched through the spring steel clamped over the hole in the scrap.

Larger stock can be drilled if a scrap piece is drilled, the stock clamped over it, and the drill run through with the scrap supporting the edges of the spring steel around the drill. *Bernard Levowich, Brookline, Mass.*

NEWS OF METALWORKING

German Light Machine Tool Production Ceilings Removed

WASHINGTON — Postwar production ceilings have been removed on western Germany's light machine tools, vanadium, and heavy tractors; limited production will henceforth be permitted in primary aluminum, certain types of heavy machine tools, sea-going ships, and ball and roller bearings; and western Germany will be allowed to retain a crude steel capacity of 13.5 million metric tons—fourth largest in the world.

Removal of production ceilings on light machine tools follows a major relaxation in August, 1947, when the U.S. and Britain agreed to let Bizonal Germany turn out 170 million reichsmark (1 Rm equals 40 cents) of machine tools annually, 83 percent of prewar. In the four power level-of-industry agreement back in March, 1946, annual machine tool output was set at only 11 percent of prewar.

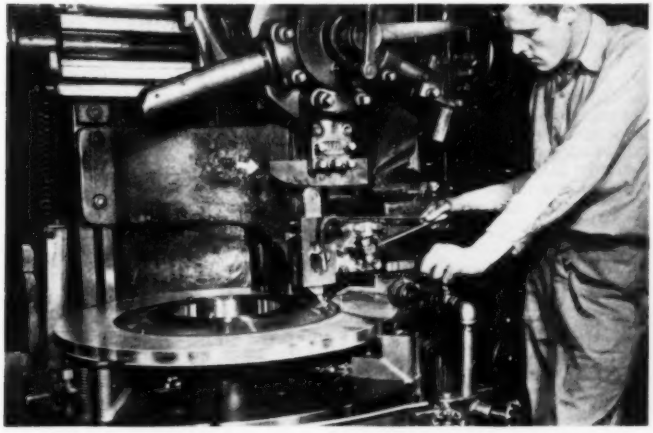
To Put Exports on Feet

Uncorking of the light machine-tool industry in the newest agreement is directly related to the U.S. drive to put Germany's export industries on their feet following the failure of Russia to cooperate in administering Germany as an economic unit, as provided for in the Potsdam agreement. Similar reasons are behind the agreement to give vanadium and heavy tractors a green light—plus others; for example, commercial radio transmitting equipment.

Heavy machine tools now to be produced on a limited basis include spiral bevel gear cutters; and certain kinds of broaching machines, lathes, milling machines, grinding machines, jig-boring machines, and gear-producing machines. However, the manufacture of these must be licensed by the recently-created Western Allied Military Security Board.

Bearings Limit Set

A primary aluminum output of up to 85,000 metric tons a year will now be permitted. But this a formality, since the British and Americans have been producing ingot aluminum in their zones for the past year. In bearings, the production limit has been set at 33 million units (on a one-shift basis) or present capacity, whichever is the smaller.



***CAM BLOCK ATTACHMENT** used with turret lathe speeds production of turbine disks at Sunnyvale, Calif., plant of Westinghouse Electric Corp. Cam plate (arrow), in contact with the roller, has exact profile required. Various types of turbine disks differ in exact contours. With this attachment, change to desired cam block profile is simple matter. Disks now can be made simultaneously on different machines*

Tool Orders Catch Up With ECA Authorizations

WASHINGTON—ECA reports that it's getting fewer complaints from machine tool manufacturers—the reason being that actual orders are starting to catch up with procurement authorizations.

ECA procurement authorizations over the last month present a mixed picture. The March 31 total for machine tools jumped to $50.6 million against $30.7 million as of February 28; however, metalworking machinery (except machine tools) dropped from $41.7 million to $29.2 million for the same period. It's not as bad as it looks though; the cut in metalworking machinery is purely bookkeeping. It will appear again listed under ECA-approved industrial projects.

Urge Stockpiling Ore in Ground

WASHINGTON—A new stockpiling policy has been laid before the steel industry by government planners—a policy calling for stockpiling iron ore in the ground to reduce consumption of rapidly dwindling reserves and making up the difference with imports.

Reminding a group of industry leaders in Washington recently that deposits of high-grade iron ore in the Mesabi range in Minnesota will be virtually depleted in ten years, government spokesmen also urged beneficiation of magnetic taconite (low grade) ores. The government even is willing to lend money for setting up the beneficiation plants.

The planners reason that it is better to import ore supplies while they are accessible and conserve domestic supplies for any emergency. This import program would take five years to get rolling. By that time 25 million tons could be flowing into the U.S. from some nine foreign sources. Another 5 million tons might be derived from magnetic concentration of Mesabi taconite—if two proposed beneficiation plants were built immediately. Drawback is big initial cost of building plants—$65 to $70 million for 5 million ton capacity—and cost of washing low-grade ore.

Small Hourly Wage Increases Seen; Downtrend in Employment Reported

WASHINGTON—Everything is touch and go in Washington on labor matters.

In government offices downtown, administration policy makers keep a close eye on the employment situation and labor's jockeying on fourth-round wage demands.

On employment, the public statements are more optimistic than what you hear privately from the experts who compile the employment figures. There is a downtrend. It is developing into a situation where, for the first time since before the war, the economy has failed to absorb the normal growth of 750,000 a year in the labor force.

Unemployment was about 2,700,000 in March. It's anticipated that in the future, short of another war, "normal" unemployment will be around 3,000,000.

See Small Hourly Wage Increases

On fourth-round wage negotiations, federal officials look for small hourly wage increases around 5 cents in most contracts, with many unions foregoing any wage increase. Others, in the more prosperous industries, like steel and automobiles, may get up to 10 cents, they believe. But there won't be any "pattern" as there was in the first three rounds of postwar wage increases. More employers will be able to settle on the basis of their own financial and business situation.

A backdrop for negotiations between Chrysler and the CIO auto workers will be the wage chronology study issued by the Bureau of Labor Statistics detailing the year-by-year settlements at Chrysler since the CIO union signed its first contract in 1939.

Minimum Rate Has Risen

The study shows that seven general wage increases have totaled 60 cents an hour. The minimum job rate in the lowest classifications has risen from 78 cents to $1.35.

The steel and auto unions are planning a major fight for pensions or health insurance plans in the contracts. The ice has been broken in this field by Allegheny Ludlum and Kaiser-Frazer. Key negotiations will be with U.S. Steel and Ford.

On Capitol Hill, the struggle rages over Taft-Hartley. The administration has given up any hope of keeping its bill intact. The big question: how much will the Republican-Southern Democrat coalition add.

Labor unions will get repeal of Taft-Hartley—in name—but much of it will remain in the new law.

Chances of a 75-cent minimum wage also are slim. If the minimum is raised—and even that isn't certain—it might be to only 60 or 65 cents.

Tito to Get German Machinery and Tools

FRANKFORT, Germany — A new $34 million trade agreement between the western zones of Germany and Yugoslavia calls for the export of nearly $19 million worth of machinery, machine tools, and other goods from Germany to the Iron Curtain country.

Unique, in one respect, where East-West trade agreements are concerned, many machine tools and industrial items normally banned to satellite countries will be included in shipments to Yugoslavia. This is part of our softening policy towards the Tito government.

Aircraft Applications Stressed in Talks at West Coast Metal Show

LOS ANGELES—Southern California's aircraft industry played a central role in both exhibits and technical sessions of the Western Metal Exposition and Congress in Los Angeles April 11-15. Some 25,000 attended the show, the sixth to be held on the West Coast.

Emphasis was placed on aircraft applications in papers read at sessions of four of the five technical societies presenting programs at the Congress—the American Association for Metals, the American Welding Society, the American Institute of Mining and Metallurgical Engineers and the Society for Non-Destructive Testing. The American Foundrymen's Society also held sessions.

Aircraft uses of high temperature alloys—coming into increasing importance with the development of jet planes—were discussed in several American Society for Metals papers.

J. F. Tyrrell, Solar Aircraft Co., reported on results of tests made by his company in cooperation with the U. S. Bureau of Aeronautics in fabricating a number of alloys for high operating temperatures.

Few heavy machine tools were on display for the first time at the show, although exhibitors presented a number of new pieces of smaller metal working equipment.

Largest machine shown for the first time was Pacific Industrial Manufacturing Co.'s hydraulic press brake, offering direct hydraulic cylinder action with full-rated power at any point of the ram stroke. A new 30-ton multi-max punch press with an underneath crank drive was shown by Diamond Machine Tool Co., Los Angeles.

Lindberg Engineering Co. demonstrated a new vibrator hearth for heat treating small parts. The furnace loads and unloads without opening its door and automatically drops the part to be treated into the quench. The vibrator can be set at any time ratio. A cool "dry" grinding unit was offered by DoAll, cooling the work at actual point of contact with the wheel.

A machine combining six drilling and tapping operations in one was shown by the Burg Tool Manufacturing Co., Los Angeles. The turret-type machine can be adjusted quickly for counter boring, threading spot facing, drilling, tapping and reaming. The Heath Engineering Co. of Ft. Collins, Colo., displayed a Woerner tubular profile cutter and a contour cutter.

Other machines shown for the first time included Hammond of Kalamazoo's backstands with automatic air belt tensioning; Sheldon Machine Co.'s 10-in lathe with 1¾-in. hole through the spindle and 1-in. collet capacity; Tyler Manufacturing Co.'s spiral bandsaw.

USED MACHINERY *Division has been expanded at Motch & Merryweather Machinery Co., with a new plant at 1350 East 222nd St., Euclid, Ohio. A 25 ton overhead crane travels and services the building's entire 300-foot length; four power reel type jib cranes aid the running-in of machines and assembly work*

Machine Tool Distributors Discuss Sales, Costs at Spring Meeting

SAVANNAH, GA.—Better selling, better training of salesmen, closer control of overhead expenses, conditional sales contracts, and the responsibilities of distributors to customers were some of the problems dealt with at the twenty-fifth spring meeting of the American Machine Tool Distributors' Association, held here at the General Oglethorpe Hotel April 11-12.

No matter what laws are enacted or what special interests may recommend to Congress, "no one has found a way to circumvent the law of supply and demand," declared Robert L. Giebel, president of Giebel, Inc., New York City, in his report as association president. He emphasized that "our only salvation is to do a good day's work every day," because "there is a good living to be made out of this business for those willing to do a good day's work every day."

Mr. Giebel expressed the view that "all our serious economic troubles are the result of expecting too much and giving too little." Commenting on the machine tool situation, he said that manufacturers are either very busy or very slow.

Fewer Machine Tool Builders

About 5000 machine tools have been withdrawn from the Janmat reserve for the Air Force's jet-engine program, despite a White House edict that the reserve is to be used only in an emergency, Tell Berna, general manager of National Machine Tool Builders' Association, charged. He pointed to the shrinkage in number of machine tool builders since the war and said that from a defense standpoint the nation cannot afford to lose more companies.

Competition from abroad is increasing, Mr. Berna asserted. The ECA program is fostering machine tool industries in western Europe. Moreover, U.S. builders soon will have vigorous competition from western Germany. He is convinced, however, that U.S. machine tools have high customer acceptance in Europe.

The fact is, according to Mr. Berna, that the foreign market looks much better, thanks to ECA-financed buying. The machine tool industry will benefit from any fundamental redesign in the automotive field and from more liberal depreciation rates, if they should be allowed.

Need Better Selling, Lower Costs

Machine tool builders will have to combat unfavorable conditions with better selling and lower costs, Mr. Berna said. He mentioned the textbook on machine tool selling which will be available for the courses to be given the coming summer in four universities, as a continuation of the program begun in 1948 at Cornell by the industry.

Local banks can do a better job than finance companies in financing "time" purchases of machine tools, said Joseph F. Owens, Jr., J. F. Owens Machinery Co., Syracuse, N. Y., in reporting for the association's committee on statistics. Mr. Owens revealed that 7.45% of the business done by 100 distributors canvassed in a survey is on a conditional-sales-contract basis. The distributors themselves finance a considerable percentage of the total. Insufficient capital, Mr. Owens declared, is the chief reason why customers resort to "time" purchases.

The distributor's responsibility to the customer just begins when he gets the order, asserted Frank Armstrong, Marshall & Huschart Machinery Co., Chicago, in a panel discussion of selling problems. The distributor then must follow through on delivery, installation, demonstration and satisfactory operation. When the customer is right, it is the distributor's duty to defend him in any controversy with the builder.

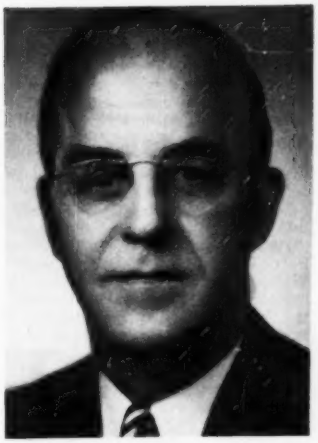
More cooperation and more imagination are needed from machine tool builders, declared E. B. MacDonald, Syracuse Supply Co., Syracuse, N. Y., chairman of the regional meeting committee. He commented that he knows cases in which customers have waited for months to get a quotation on a standard machine with special tooling. He noted unwillingness on the part of some builders to make other than standard machines.

Uses and Abuses of Entertainment

Speaking on "Entertainment—its Uses and Abuses," T. R. Rudel, president of Rudel Machinery Co., Inc., New York City, suggested that entertainment should follow, rather than precede, a substantial order. "This establishes your product as sold on merit alone; your entertainment is a gesture of gratitude, and both of you enhance your standing. In reverse, however, suspicions may unnecessarily be started which will spoil all of your efforts."

Lloyd A. McDonald, vice president of Warner & Swasey Co., Cleveland, and president of National Machine Tool Builders' Association, was a surprise speaker at the first day's session.

Plans were announced for the twenty-fifth annual meeting of the association to be held in Cincinnati Oct. 31-Nov. 1. Mr. Giebel presided at all sessions of the spring meeting.



***ROBERT L. GIEBEL**, president of American Machine Tool Distributors' Association, who presided at all sessions of the association's spring meeting at Savannah, Ga.*

Predict Increase In Magnesium Use

CHICAGO—A 60% increase this year in primary magnesium consumption is predicted by W. S. Loose, general sales manager, Dow Chemical Co. He spoke at the 5th annual meeting of the Magnesium Association, held here April 19 and 20.

Reductions have brought magnesium prices for tubing and shapes down to or below those for 61ST and 63ST aluminum on a per-foot basis. Demand for magnesium sheet at the present time far exceeds the available supply. Authoritative sources indicated that a continuous strip mill (*AM*—April 7, '49, p. 126) would soon be built to solve this problem. Questions now seem to center more on the location than anything else.

Alloy developments include a wrought zinc-zirconium alloy, ZK60, now finding appreciable commercial use. Development is continuing on the high-strength alloys containing lithium.

Dow has done some experimenting with the cerium high-temperature alloys to employ magnesium in making dies for permanent-mold casting. Advantages include the ease of fabrication, light weight for handling, and virtual elimination of need for shrinkage allowance in the dies.

Officers elected include A. W. Winston, Dow Chemical Co., as president; Bruce Magill, Dominion Magnesium, as vice president; and Ralph Ferguson, Eclipse-Pioneer Div., Bendix Aviation, as treasurer. Retiring president is George Motherwell, Wyman-Gordon Co.

ECA O.K.'s Steel Plants in Europe

WASHINGTON—ECA has approved some $50 million in steel production and aluminum foil projects for the United Kingdom, Austria, and France. Of this $29 million will be obligated before June 30.

The U.K. project, to cost $27 million in ECA funds, calls for a tinplate and sheet mill at Margam, near Port Talbot, Glamorgan, in South Wales. It is part of an overall $240 million development plan in which the largest steel manufacturers in Wales have joined together to form a new company, The Steel Company of Wales, Ltd.

Rolling mill equipment and other special items will be bought in the U.S. Metalworking trades, the automotive and container industries will consume the bulk of the increased supply of flat rolled steel.

For Austria, $10.7 million has been set aside for a slabbing and blooming mill, and a hot strip mill at Linz. The slabbing mill calls for $548,000 to be obligated prior to June 30, with $2.8 million in ECA dollars the long range cost. A little over $1 million in orders and contracts will be placed right away, with $7.9 million the over-all cost.

In Austria, the rolling mill is being constructed by the Mesta Machine Co., Pittsburgh, while other equipment is being supplied by the Continental Foundry and Machine Co., Chicago.

ECA has also approved two mills in France to cost right away $9 million and finally a total of $12 million in ECA funds. One mill is a hot strip plant at Denain in northern France; the other is a cold mill at Montataire, 35 miles north of Paris.

ECA-supplied special equipment for two French aluminum foil plants, one at Rugles, near Le Havre and the other at Froges, will have an immediate cost of $825,000 and total expenditure of ECA money of $1.1 million.

159 German Plants to Remain in Western Zones

WASHINGTON — The new plant dismantling agreement on German industry involves retention of 159 plants or part plants in the western zones that would otherwise have been dismantled and shipped as reparation to 12 "western" allied countries including France, Britain, Czechoslovakia, Poland, Belgium, the Netherlands, India, New Zealand, and Australia.

***GAGING EXPERTS** representing armed services and industry gathered at a Gage Industry Division meeting of the American Ordnance Assn., Wright-Patterson Field, Dayton. Among experts attending were (left to right): Col. W. E. Becker, commanding officer, Frankford Arsenal, Philadelphia; Brig. Gen. B. O. Lewis (Ret.), staff consultant, American Ordnance Assn.; Louis Polk, president, The Sheffield Corp.; Capt. A. D. Blackledge, USN, commanding officer, Naval Ordnance Plant, Indianapolis; Col. H. B. Hambleton (Ret.), formerly on the staff of the Chief of Ordnance; and Brig. Gen. S. E. Reimel (Ret.), director, Production Equipment Div., NSRB.*

Renegotiation Board Issues Guide For Determining Excess Profits

WASHINGTON—A set of guides to be followed by the military in determining excessive profits under the Renegotiation Act of 1948 is ready for circulating in the metalworking industry.

The six-page regulation, written by the military renegotiation policy and review board, contains "tips" to contractors who are subject to the regulation.

Although the military so far has directed renegotiation only toward aircraft procurement, and has privately agreed that shipbuilding is better handled by the old Vinson-Trammel Act, all contracts obligating money appropriated by Congress for fiscal 1949 are subject to renegotiation.

The best rule of thumb to determine whether a contractor is subject to renegotiation: add up all contracts involving $1,000 or more, and if the total reaches $100,000, the contractor is eligible.

As a general policy in making renegotiation determinations, the military agencies are directed to:

(1) Give the contractor an opportunity to develop and present whatever information is available to him which he considers pertinent to the case.

(2) Keep requests for additional information and the number of meetings with the contractor to a minimum.

(3) Review financial and factual information with the contractor and obtain his agreement as to its accuracy.

(4) Give every reasonable assistance and all necessary information with respect to technical requirements of renegotiation to the contractor.

(5) Require no refunds of excessive profits, in the absence of unusual circumstances, in an amount less than $5,000. Nor will the amount of excessive profits to be eliminated in any one year from the aggregate amount of gross receipts exceed the amount by which such aggregate exceeds the $100,000 floor.

West Australia to Get Iron and Steel Industry

MELBOURNE (McGraw-Hill World News)—An $8-million company has been formed to establish a comprehensive iron and steel industry in Western Australia, Australia's Golden State. Substantial parcels of stock have been taken up by the state government and by a former Armco executive, R. S. Conrow.

Cost Control Stressed at Production Conference of Management Group

NEW YORK—Cost control in the face of increasing pressure for lower prices and the obligation of industry to its employees ranked high among the topics occupying the attention of hundreds of management executives at the recent Production Conference of the American Management Association held at the Hotel Waldorf-Astoria.

Dr. A. D. H. Kaplan, of the Brookings Institute, reminding industry of its heavy social responsibility and its vital stake in continued high national income and purchasing power, called upon basic units in the economy to provide assurance that new projects will be advanced to take up the slack when present business activity tapers off. As an example, the speaker cited the great potential that exists in bringing air-conditioning within reach of millions of American families.

Speaking of equipment buying, Frederick L. Schuster, business consultant, pointed out that it is not the price level as such but rather the opportunity for lower unit costs that should influence the purchase of new equipment. In making such decisions, the speaker urged management to weigh the following factors: "(1) your own unit labor cost in relation to competition, (2) the degree of flexibility in your costs, (3) the level of your break-even point, and finally, (4) the source of funds with which to buy equipment."

The conference turned to consideration of specific methods of cost control with a series of addresses covering the break-even chart, the flexible budget, and the multiple use of standards.

Other phases of management control taken up in a concurrent session included quality control, job evaluation and incentives, and development of human relations understanding in foremen. Separate panel discussions discussed problems that must be solved when adjustments to the working force are necessary.

Tyrol Plant Leads Europe In Sintered Metal Output

VIENNA—Austria has reached a hard-metal manufacturing capacity of 12 metric tons annually at the Metallwerk Plansee in Reutte (Tyrol), the country's only powder-metallurgy plant. Austria's own requirements take about 3 tons a year, thus leaving some 9 tons for export to all parts of the world, especially the Marshall Plan area. Reutte is today Europe's leading manufacturing concern in the field of sintered metal production. Aside from turning out some of its own raw material, the plant produces cutting-tool bits, bearings, dies, and various machine parts of complicated design.

California Firms Pool Sales Efforts

LOS ANGELES—Warren W. Smith has been appointed sales manager of Western Manufacturers Associated, an organization of small manufacturers in the Los Angeles area similar in aims to the Small Industries of Northern California in the San Francisco Bay Area.

Smith will head a cooperative sales program designed to help the association's member plants meet increasing business competition. Handling of the members' sales programs by a central agency is expected to increase contract work and level out peaks and valleys of shop loading. Member plants also will be utilized for local manufacture, under license, of products now shipped into the area from the East.

Headquarters for the southern California group are at 1452 N. Seward St., Los Angeles. The northern California association has offices at 616 29th St., Oakland.

MEETINGS

Packaging Machinery Manufacturers Institute, May 9, Hotel Dennis, Atlantic City.

Instrument Society of America, May 12, 13, Royal York Hotel, Toronto.

Grinding Wheel Institute and **Abrasive Grain Association,** May 12-14, The Homestead, Hot Springs, Va.

Metal Treating Institute, May 30-June 1, Chateau Frontenac, Quebec.

Canadian International Trade Fair, May 30-June 10, Exhibition Grounds, Toronto.

The Magnesium Association, July 14, 15, Niagara Falls, Canada.

Int'l Harvester Building Tractors in Australia

MELBOURNE (McGraw-Hill World News) — International Harvester Company's old-established assembly plant at Geelong, Victoria, has been expanded and tooled up at a capital cost of between $5,000,000 and $10,000,000 to produce major components for tractor assembly on the spot.

Two wheel-type tractors, the Farmall and the W-6, will go into production shortly at the combined rate of fifteen units a day.

About a hundred major American machine tool units have been bought from War Assets Administration stocks, in addition to a number of new American and British machines.

***TOLEDO FOREMEN'S CLUB** gathering on April 9 inspected plants of The Cincinnati Milling Machine Co. in Oakley. In attendance were (left to right) George Binns, vice president, Cincinnati Milling & Grinding Machines, Inc.; Sir Greville Maginness, chairman and managing director of Churchill Machine Tool Co., Ltd., Manchester, England; Frederick V. Geier, president, and A. L. Plimmer, die sinking specialist, the Cincinnati Milling Machine Co.*

Detroit

AUTO INDUSTRY SPEEDS PRODUCTION . . . CAR PRICES MAY DROP AGAIN
WILDCAT STRIKES PLAGUE PLANTS . . . TOOLING MAINTAINS EVEN PACE

Production speeds are making one of their periodic appearances in the center of the automobile stage. Their entry has been signified by a rash of wildcat strikes in the car and accessory plants.

Manufacturers explain the strikes by saying that they are customary when new parts and processes are introduced as part of a model change. The CIO United Auto Workers Union, of course, says that every such change has been in an upward direction, that the workers are being asked to turn out more pieces than before. One offshoot of this dispute has been, as always in the past, an inability of companies to run new production equipment at maximum levels without risking unauthorized walkouts.

The union seems a little more ready than in the recent past to make issues of these circumstances. Perhaps this is because the hopes of wage increases in forthcoming contract negotiations seem to be glimmering, which means that pressure must be generated in some other channel.

UAW Strike Vote at Ford

Ford Motor Co. workers enrolled in the UAW have taken a strike vote in support of their complaints that final assembly speeds have been jacked up. The temper of the workers at Ford—who have not been out on a major strike in many years and, consequently, are "ripe" for commotion—is definitely high. Their attitude is being stimulated by their local union leadership, whose views may be pretty well summarized by this statement from the president of Local 600, Thomas Thompson:

"I am opposed to submitting the grievance in this, or any other production standards case, to arbitration, for to submit it to arbitration is to re-submit it to the consideration of the time study men. I am opposed to settling speed-up grievances on the basis of the science of time study. . . . Cold, inflexible figures have never been able to solve problems arising from human factors."

This, after Thompson signed a contract less than a year ago specifically permitting arbitration of time disputes if both parties agreed!

Increased Need for Labor

Perhaps labor militancy of the moment is being enlarged by increasing need for labor. As companies head into their biggest seasonal production period, they are getting more sheet steel than at any time since 1940, and consequently they are seeking to enlarge their manufacturing volume. Some concerns reportedly might go onto second shift final assembly operations if they could obtain enough manpower by midspring. Chrysler in particular is considered a likely prospect for two-shift assembly; its efforts to stock dealers after introductions of its four new lines in the spring were handicapped by a series of quickie strikes at Midland Steel Products Co. and Briggs Mfg. Co.

The pace of production is well indicated by the figures. The second April week saw output of no fewer than 133,000 cars and trucks in U.S. and Canadian plants, highest total for any week since the war ended. This showing and others like it resulted in Ward's Reports, Inc., raising its projection of second quarter output from 1,270,000 units "considerably closer to the all-time high of 1,506,494 reached in the 1929 second quarter."

Lower Car Prices Possible

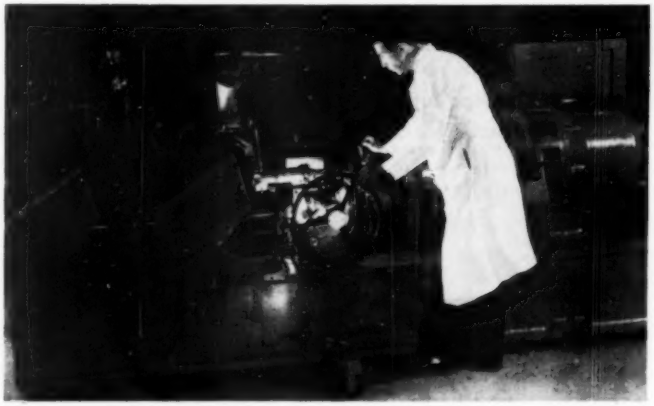
Sustained volume of this sort might do a lot toward bringing car prices down. The sudden relief in the tight steel picture could result in quicker amortization of tool costs than had been anticipated, and attendant lower costs. Naturally no hard-and-fast conclusions on this score can be reached before the negotiations are completed this spring with the unions—higher wage or fringe payment bills would wash out such economies quite rapidly.

Nash and Hudson, meanwhile, have followed the suits of GM, Ford, Willys and Kaiser-Fraser in reducing prices. To date, actually, no one beyond K-F has reduced quotations significantly, except on convertible models, whose sales prospects have plummeted sharply down.

Despite the booming volume of automobile manufacturing, there is no broad optimism in the car capital of Detroit. Indicative are figures on inventories, as compiled by the Purchasing Agents Assn. of Detroit. No fewer than 15% of all buyers reporting were buying on a hand-to-mouth policy; another 35% were doing their purchasing on a 1-month-ahead basis. In January, by contrast, these respective figures were 12% and 20%.

Tool Business Steady

Tooling business in Detroit, meanwhile, continues along at a fairly even gait, well below activity levels of the earlier postwar years. Forging dies are somewhat more in demand than in the past, with delivery promises of major shops averaging close to 6½ weeks as of mid-April. Sheet metal dies, on the other hand, still can be had in about 4½ weeks. Gages are available on almost an off-the-shelf basis, while jigs and fixtures are being promised in slightly over 4½ weeks at most shops.



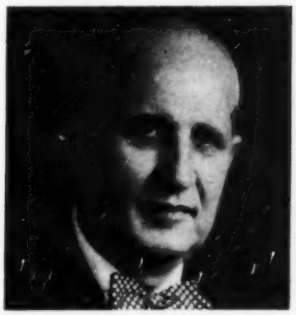
***ENGINE ASSEMBLY BALANCER**, displayed by General Motors Research Laboratories, dynamically balances an entire motor car engine in production by drilling holes near the rim of the engine flywheel to eliminate excess of off-center weight*

Names in the News

Carl F. Roby

Swan E. Bergstrom

George W. Binns



Lester F. Nenninger

Carl F. Roby, vice president of The Cincinnati Milling Machine Co., has been elected director. **Swan E. Bergstrom,** sales manager, has been named vice president. **George W. Binns** and **Lester F. Nenninger** have been elected vice presidents and directors of Cincinnati Milling & Grinding Machines, Inc., sales subsidiary of the Cincinnati Milling Machine Co. Mr. Binns has been active since 1906 in development of the company's grinding machine business and as executive head of various departments. Mr. Nenninger started with the company in 1912. Since 1943 he has been works manager.

Robert S. Gruver, manager of the Ashland, Ky., division of Armco Steel Corp. has been appointed administrative assistant—operating division, and will be located in the company's general offices at Middletown, Ohio. **J. M. Lobaugh,** general superintendent of the Ashland plant, will succeed Mr. Gruver as manager. **Harry B. Nicholson** has been made general superintendent and **George H. Todd,** assistant general superintendent.

Richard J. Conroy has been named district manager of the Los Angeles branch office and warehouse of Whitman & Barnes Div. of United Drill and Tool Corp., Detroit, succeeding the late **E. L. Foreman.** Mr. Conroy was previously with the Independent Pneumatic Tool Co.

Harry C. Dumville has been appointed director of the General Motors Corp.'s new devices section, succeeding **John H. Hunt,** retired. Mr. Dumville has been serving since 1944 as assistant director of the section.

W. M. Merchant and **R. J. Andrews** have been elected director of The Euclid Electric & Mfg. Co., Madison, Ohio.

R. A. Lomas, service engineer at the Seattle branch of Black & Decker Mfg. Co., Towson, Md., has been transferred in the same capacity to the Los Angeles branch to supervise all service activities in southern Calif. He has been succeeded in Seattle by **G. S. Ellis.**

Paul E. Lees has been appointed vice president in charge of sales of Standard Tool Co., Cleveland. Mr. Lees has had wide experience in the cutting tool industry, and was formerly an executive of The Welden Tool Co., Cleveland.

Tinkham Veale II has been appointed assistant to the president of The Ohio Crankshaft Co., Cleveland. He has been with Ohio Crankshaft since 1942, serving for the past three years as manufacturing and administrative head of the company's Tocco Div.

Eric G. Skarin has been named service metallurgist for The Ohio Ferro-Alloys Corp., Canton, Ohio. He was formerly metallurgist at the Midvale Co., Philadephia, and was previously in the alloy open hearth dept. of Bethlehem Steel Co., Bethlehem, Pa.

Carl G. Malmberg, superintendent of the tank and plate shop of Allis-Chalmers, Milwaukee, is now also superintendent of the company's forge shop, succeeding **F. A. Breig,** retired.

Wallace W. Smith, formerly general superintendent of the Pittsburgh plant of Pittsburgh Screw and Bolt Corp., has been appointed manager of operations of both the Pittsburgh and Graham plants. **Russell T. Pollock,** formerly asistant superintendent of the Pittsburgh plant, has been appointed general superintendent there. **R. L. Irvin,** works manager of the Graham Bolt and Nut Div., will continue in his present capacity. **F. B. Gordon,** formerly vice president in charge of operations, and **G. H. Lee** will continue as vice presidents of the corporation in advisory positions.

Harry D. Garber, Charles B. Bednar, and **Lawrence Jones** have been named vice presidents of The Van Dorn Iron Works Co., Cleveland.

Charles W. Meyers has been named manager of a new mechanical spring sales division of American Steel & Wire Co., Cleveland. He was formerly director of spring mill products at Cleveland, and previously was superintendent of the spring mill at the firm's South Works, Worcester, Mass.

L. B. McCarthy has been elected vice president in charge of operations of The General Fireproofing Co., Youngstown, Ohio. He is being succeeded as general superintendent of the firm by **A. H. Anderson.**

R. E. Valk has been appointed works manager of Toledo plant of The National Supply Co., Pittsburgh, succeeding **L. A. Ringman,** resigned.

Alex Cruickshank has been appointed plant engineer in charge of maintenance for McConway & Torley Corp., Pittsburgh. Previously he has been associated with the New England Metallurgical Corp. and with Jones and Laughlin Steel Corp.

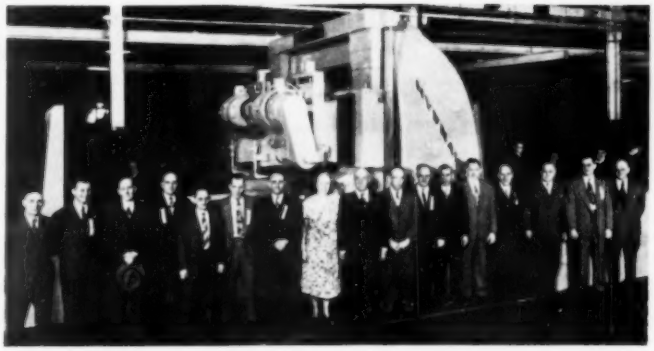
Frank A. Weiss has been appointed assistant to the general manager of the Hyatt Bearings Div., General Motors Corp., Harrison, N. J.

Clarence Snyder has been named chairman of the board and vice president of the Arthur Colton Co., Detroit, following the recent purchase of that firm by Snyder Tool & Engineering Co., Detroit. **Howard N. Maynard** has been named president and treasurer; **K. B. Hollidge,** executive vice president and secretary; **Harvey W. Purdy,** assistant secretary; **Samuel D. Harrison,** assistant treasurer; **Alfred W. Kath,** director of engineering; **Nelson Carman,** director of sales.

Sidney E. Horton, Donald B. Hunting, Douglas H. Thomson, Paul W. Adams, H. Bissell Carey, Jr., Mary A. Caffrey, L. McGregor Demarest, and **Spencer Montgomery** have been elected directors of E. Horton & Son Co., Windsor Locks, Conn.

Logan C. Miller

Logan C. Miller has been appointed general manager of Ford Motor Co.'s newly named Rouge Div., which forms the major part of the former General Production Div. Mr. Miller has been with the company since 1914, starting as a diemaker in the plant tool room. Later he became superintendent of the motor building at the Rouge plant and then assistant general superintendent. For the past three years he has been general manager of Rouge Automotive Manufacturing Operations, which now becomes Automotive Manufacturing Operations, under **Ray H. Sullivan,** who was Mr. Miller's assistant, and formerly vice-president in charge of manufacturing at the E. W. Bliss Co. The Highland Park plant will now come under the direction of **John Dykstra,** general manager of the General Manufacturing Div.



***OPEN HOUSE** at The Thompson Grinder Co., Springfield, Ohio, honored employees having more than 20 years service with the company. Standing before the new Thompson Hydrail Surface Grinder the veterans are, left to right, Fred Sievert, John Rewitzer, Scott Yeazell, William Schutte, Robert Kugler, Charles Shay, George Schutte, Secretary Ruth Andrews, President Christian Baldenhofer, Vice President W. G. Baldenhofer, Ira Wheeler, Rudolph Zieman, Herbert Smith, Clyde Drake, William Drumm, William Glynn, and Clarence Shewalter*

Philip Finale has joined Loewy Construction Co., Inc., rolling mill division of Hydropress, Inc., N. Y., as chief engineer. He has been associated with the Mesta Machine Co. since 1928, where he held the positions of rolling mill designer and proposal engineer until 1939. He later became rolling mill dept. engineer, which post he held until he joined Loewy.

Business Items

Midwest Tool & Mfg. Co., Upper Sandusky, Ohio, has changed its name to the **Sheldrick Mfg. Co.** The plant was recently moved to Upper Sandusky from Detroit.

Revere Copper & Brass, Inc., has opened a plant at 6500 E. Slauson Ave., Los Angeles, for the fabrication of copper and copper alloys.

Butterfield Div. of Union Twist Drill Co., Derby Line, Vt., has appointed **Johnson-deVou, Inc.,** Boston, as distributor for the Boston area. Johnson-deVou offices in Worcester and Springfield will also carry the Butterfield line.

Standard Reamer & Tool Co., Detroit, has changed its name to **Special Cutter & Tool Co.,** and has moved to 401 Salliotte St., Ecorse, Mich.

Whiton Machine Co., New London, Conn., has appointed the **H. C. Hook Co.,** Worcester, Mass., as representative in the states of Massachusetts, Rhode Island, Vermont, New Hampshire, and Maine. **Vandyck Churchill Co.,** New Haven, Conn., will represent Whiton in Connecticut.

Hardinge Brothers, Inc., Elmira, N. Y., has moved its Rochester office to 491 Main St., East.

Obituary

Col. Frank A. Scott, 76, World War I production chief, former president and later chairman of the board of Warner & Swasey Co., died at his home April 15. He was a director of Youngstown Sheet & Tube Co. and of other organizations.

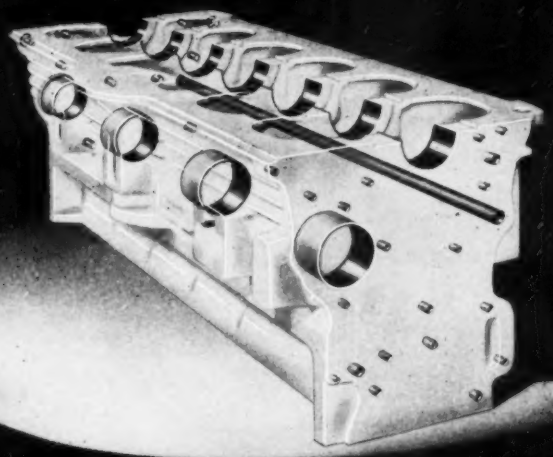
Frank H. Stohr, 47, general manager of the Allis-Chalmers Mfg. Co.'s Norwood, Ohio, Works, died March 29. He was named general manager in January of this year. Previously he was with Westinghouse Electric Corp., Pittsburgh, and with the Elliott Co., Jeannette, Pa., where he served as executive vice president and director.

Knute Berger, 59, president and general manager of Berger Engineering Works, Seattle, died March 21.

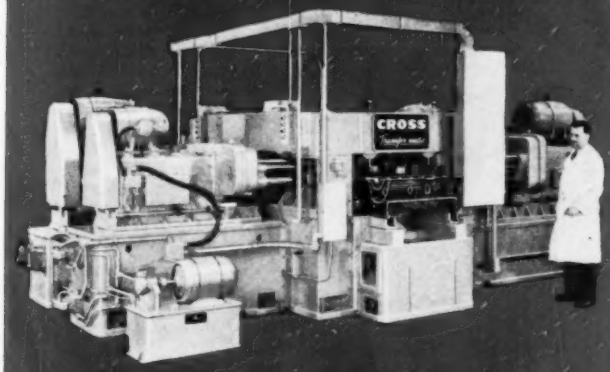
George W. Smith, Sr., 71, senior member of the firm of G. W. Smith and Sons, Inc., Dayton, Ohio, died March 25 at his home, after a year's illness. He was a pioneer in the die-casting business in Dayton in the early 1900's.

Frank E. Vigor, 62, vice president in charge of operations, Armco Steel Corp., Middletown, Ohio, died April 12 at Cleveland. During World War II he was a member of the Iron and Steel Section of the Office of Production Management. Later he was assistant director of the Steel Div. of the War Production Board.

Another Transfer-matic by Cross



BORES, DRILLS, REAMS
Cylinder Blocks



★ Rough bores seven crankshaft and four camshaft bearings, drills oil gallery hole complete, drills 21 holes in front face, drills 10 holes in rear face, and rough reams two locating holes in rear face. Production requirement, 35 hourly at 100%.

★ Transfer mechanism carries parts from station to station, power elevator positions parts, and individual clamps secure parts at each station.

★ Seven stations include loading station, five working stations and intermediate inspection station.

Established 1898

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DETROIT 7, MICHIGAN

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

made to Starrett *Standards*

...and American Gage Design Specifications

BACK — A solid die casting with clamping lug. Lug may be on or off center or adjusted at right angles to the spindle. Black crackle finish.

CASE — Concentrically machined with stem cast integral. Chromium plated. Stainless steel bushings support spindle in the stem.

BEZEL — A die casting with coarse peripheral serrations. Turns dial in relation to the hand. Chromium plated.

BEZEL CLAMP — Securely locks bezel in any position. Chromium plated. Patented.

DIAL — Specially enameled for easy cleaning. Graduations distinct and accurate.

HAND — Tempered steel, blued finish. Nicely balanced and will not slip on the center pinion. Formed to facilitate reading over graduated lines.

JEWELS — Genuine Sapphires in special mountings for ready replacement. Provide the thrust of staff shoulders and give a smoother action to the gage.

CRYSTAL — Thick, clear Pyralin, transparent as glass and nonbreakable.

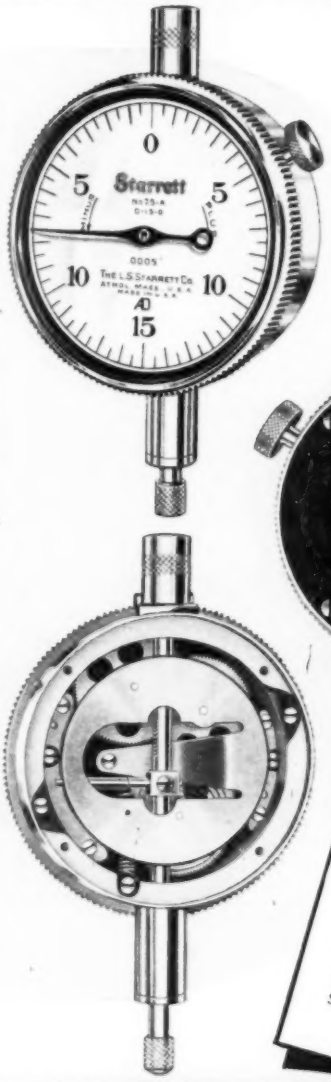
BRIDGE — Hard brass, nickel plated. Slotted and finished to permit using an unusually long guide pin which prevents rotative movement of the rack.

RACK AND SPINDLE SPRING — A coil spring of uniform and correct tension eliminates harsh action of the rack and spindle.

SPINDLE — Stainless Steel. Travels in bushings, also of stainless steel. Holds the unusually long guide pin.

GEAR TRAIN — Stainless Steel including the hair spring. All gears and pinions cut and finished to extreme accuracy.

PLATE — Hard brass, nickel plated, uniformly machined. This is the base plate to which all working parts are attached.



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Starrett Dial Indicators, Series Nos. 25, 81, 655 and 656 conform in all respects to the requirements of American Gage Design Specifications and, in addition, provide many exclusive Starrett features which contribute to greater durability, accuracy and efficiency in use. For complete information, write for Starrett Dial Indicator Catalog C

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American Machinist REFERENCE BOOK SHEET

Charts for Press-Fit Forces . . . I

BY TYLER G. HICKS

FREQUENTLY during production and machining operations, the force required to make a press fit is needed. Required force will determine which press must be used and the approximate setting necessary. Charts on accompanying pages permit quick determination of press-fit forces for two conditions: a steel shaft to a steel hub, and a steel shaft to a cast-iron hub.

Example 1 (Steel to steel chart): A 10-in. steel shaft is to have a steel hub 16 in. long pressed on its end. Hub outside diameter is 20 in. An allowance of 0.001 in. per in. of shaft diameter has been specified. What force is required to make the fit?

Solution: See diagram of chart usage. Ratio of shaft to hub diameter is 10/20 = 0.50. From the 0.001-in. allowance curve, project vertically to the curve marked 0.50. Next run horizontally to the 10-in. shaft-diameter curve, then drop vertically to a hub length of 16 in. Project left to the 0.1 friction-factor curve, then downward to read: 280 tons required force.

This is the force necessary to press the hub on the shaft under normal conditions. When excessively rough shafting is used or when hub bore is uneven, a higher coefficient of friction gives more accurate results. For such cases use values between 0.18 and 0.25.

Example 2 (Steel to cast-iron chart): An 8-in. steel shaft is to have a cast-iron crank with a 10-in. hub pressed on its end. Hub outside diameter is 14 in. and the allowance is 0.0012 in. per in. of shaft diameter. What force is required to make the fit?

Solution: Ratio of shaft to hub diameter is 8/14 = 0.57. From the 0.0012-in. allowance curve, project upward to a curve lying between 0.55 and 0.60, or 0.57. From here run across to the 8-in. shaft-diameter curve, then drop downward to a hub length of 14 in. Project left to the 0.1 friction-factor curve, then drop downward and read: 90 tons, required force.

These charts save considerable shop and office time because they eliminate many tedious calculations. Shafts may be either solid or hollow. Any unknown can be solved, provided the other five are known. For instance, to prevent overloading of an existing press, enter the chart with the press capacity and solve backwards. Allowable hub lengths, shaft diameters, and diameter ratios will then be found. A list of these values posted alongside the press will prevent overloading in the future.

Derivation of the Charts

These charts are based on equations found on pages 442 and 458 of "Design of Machine Members" by Vallance and Doughtie, and published by the McGraw-Hill Book Company. The chart for steel-to-steel assemblies is based on the equations:

$$p_c = \frac{AE\ (d_c^2 - d_i^2)\ (d_o^2 - d_c^2)}{2d_c^2\ (d_o^2 - d_i^2)} \qquad (1)$$

and

$$F = \pi\ dLf\ p_c \qquad (2)$$

where A = total allowance, in.
E = modulus of elasticity
d_o = outside diameter of external member, in.
d_c = nominal diameter of contact surfaces, in.
d_i = inside diameter of internal member, in.
p_c = radial pressure between members, psi
F = press-fit force, lb.
π = 3.14
d = nominal shaft diameter, in.
L = hub length, in.
f = coefficient of friction

Graphical solution eliminates the necessity of the radial pressure calculation, which is of little interest to the man in the shop. Instead he obtains directly the press fit force which he must know in order to choose the proper press.

The chart for press-fitting a steel shaft to a cast-iron hub is based on these equations:

$$p_c = \frac{A}{d_c}\left[\frac{d_c^2 + d_i^2}{E_s\ (d_i^2 - d_i^2)} + \frac{d_o^2 + d_c^2}{E_h\ (d_o^2 - d_c^2)} - \frac{m_s}{E_s} + \frac{m_h}{E_h}\right] \qquad (3)$$

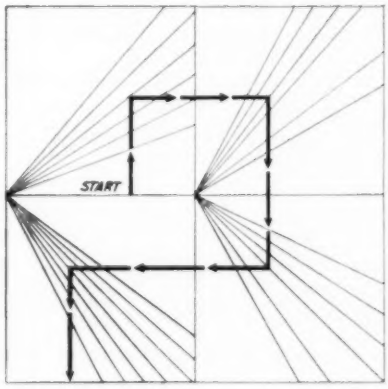
and

$$F = \pi\ dLF\ p_c$$

Symbols are as before, and,

m = Poisson's ratio of lateral contraction

$\left.\begin{matrix} s \\ h \end{matrix}\right\}$ = subscripts referring to different materials



Single Slide and Duplex Surface Broaching Machines 5, 10, 15 and 25 ton capacity

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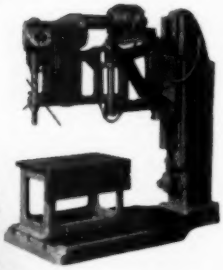
Continuous Type Machine Built in Four Sizes

Stub Type Cylinder Boring Machines



Unique Bracket type Hammond Radial Drilling and Tapping Machine

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Way Type Drilling, Boring, Reaming, Tapping and Milling Machines with One, Two or More Ways . . . Station Type Machines . . . Center Column Type Machines . . . Cylinder Boring Machines . . . Inverted Drilling Machines . . . Surface Broaching Machines . . . Sensitive Drilling Machines . . . Hammond Radial Drilling Machines . . . Hammond Surface Grinding Machines . . . Manufacturing Type High Duty Drilling Machines . . . Independent Feed Drilling Machines . . . Special Machines.

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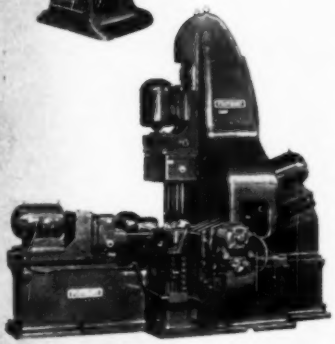
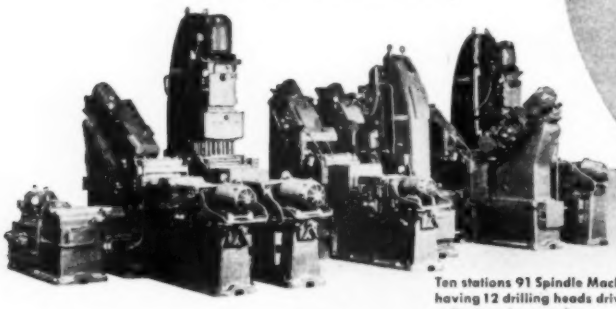


Five Way 21 Spindle Lead Screw Tapping Machine



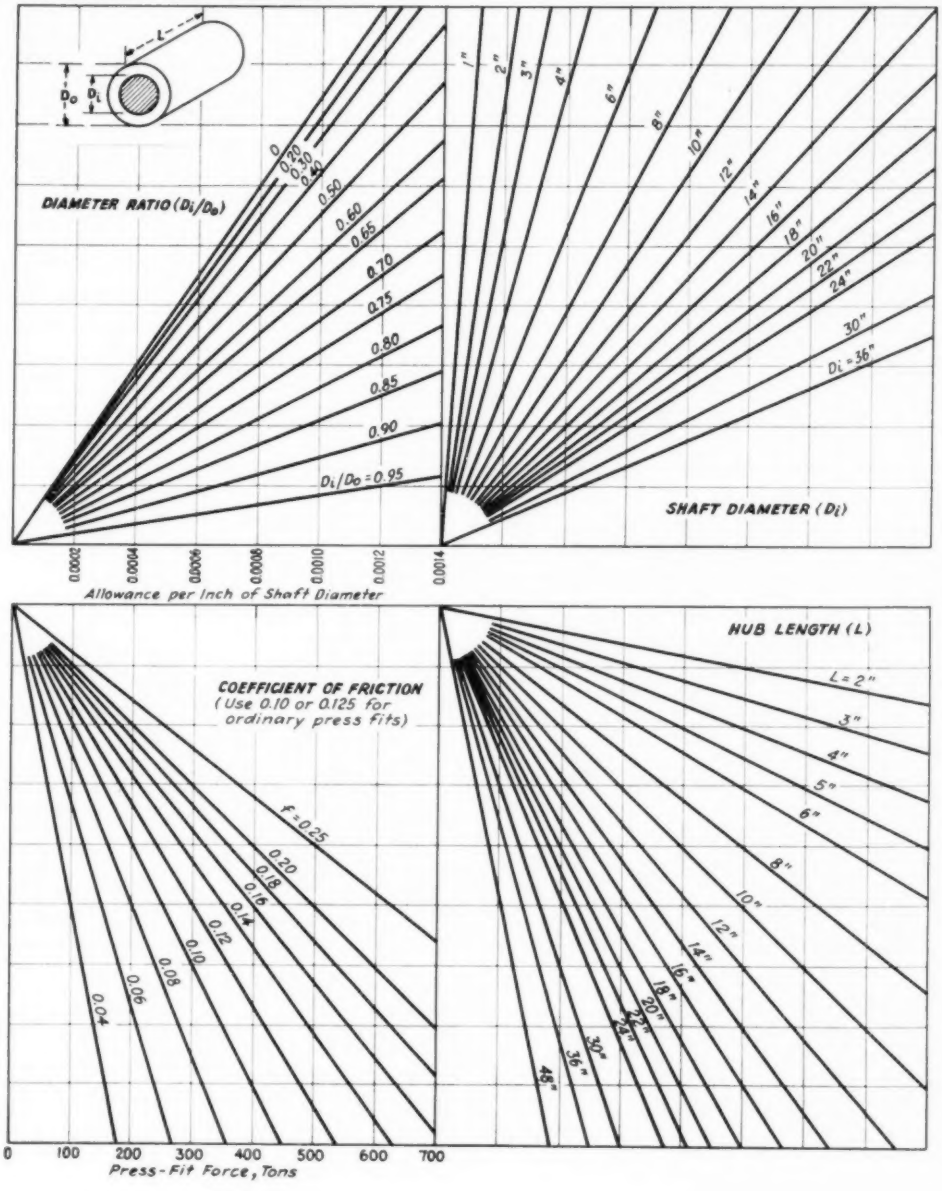
Ten stations 91 Spindle Machine having 12 drilling heads driven by units at various angles

FOOTBURT PRODUCTION MACHINE TOOLS

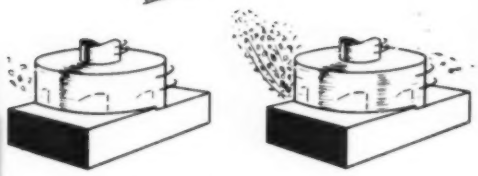
A TIME TESTED LINE OF MACHINE TOOLS

Charts for Press-Fit Forces . . . II

STEEL SHAFT TO STEEL HUB



Short-Cuts to Good Milling ...by Stainless Sam

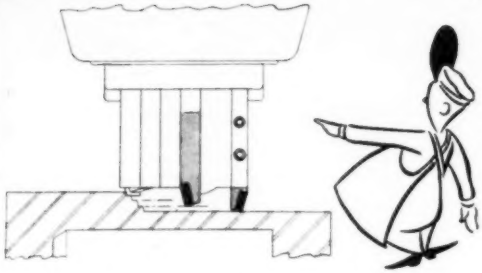


1

Either conventional high speed steel tools or carbide tools can be used for milling Stainless Steels.

Carbide tools are usually of no advantage on old under-powered machines. But with modern heavy-duty equipment, large quantity production, and sufficient power, carbide tools often make it possible for you to increase cutting rates 100% and more. Minimum feed per tooth of .005" is recommended.

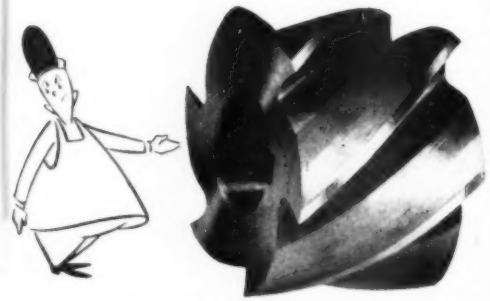
Actually, feeds and speeds with carbide tools are limited only by facilities for chip disposal and by available horsepower.



2

For face milling on heavy-duty equipment, Stainless Sam recommends a high speed steel with cobalt addition, or cast alloy types for the cutting edges of face mill blades.

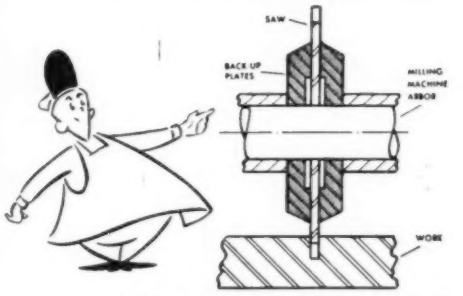
Carbide-tipped cutters may be used economically on step mills (modified face mills with inserted tools). Step mills are designed for deep cuts at relatively low feeds per revolution. With cutting edges set at progressively greater depths, only one tool makes the final finishing cut. (See drawing.)



3

Because of its positive shearing action the helical type slab milling cutter is used for all types of Stainless Steels. Heavy table feeds and slow spindle speeds should be used for the chromium-nickel grades.

Conventional milling is recommended for older equipment. With newer machines, or old equipment provided with a back-lash eliminator, climb milling may give best results.



4

Teeth should be properly backed off when sawing Stainless Steels with high speed steel circular saws. Coarse tooth saws with staggered teeth are recommended for deep, wide cuts. Fine tooth saws should be used for light sections.

Whenever possible, heavy spacing collars should be mounted on each side of the saw to strengthen the blade (see drawing). Diameters of the collars should be as large as the depth of the cut will permit.

Milling Stainless Steels is only one of many subjects discussed in Armco's valuable new booklet on machining.

Write for your copy today. It may surprise you to know how easy it is to machine ARMCO Stainless Steels with standard equipment.

And you may be in line for another pleasant surprise if you make a cost-study of each part of your product—comparing Stainless with the material you are using now.

When you write for a copy of the booklet, just ask for "Machining of ARMCO Stainless Steels." Address Armco Steel Corporation, 500 Curtis Street, Middletown, Ohio.

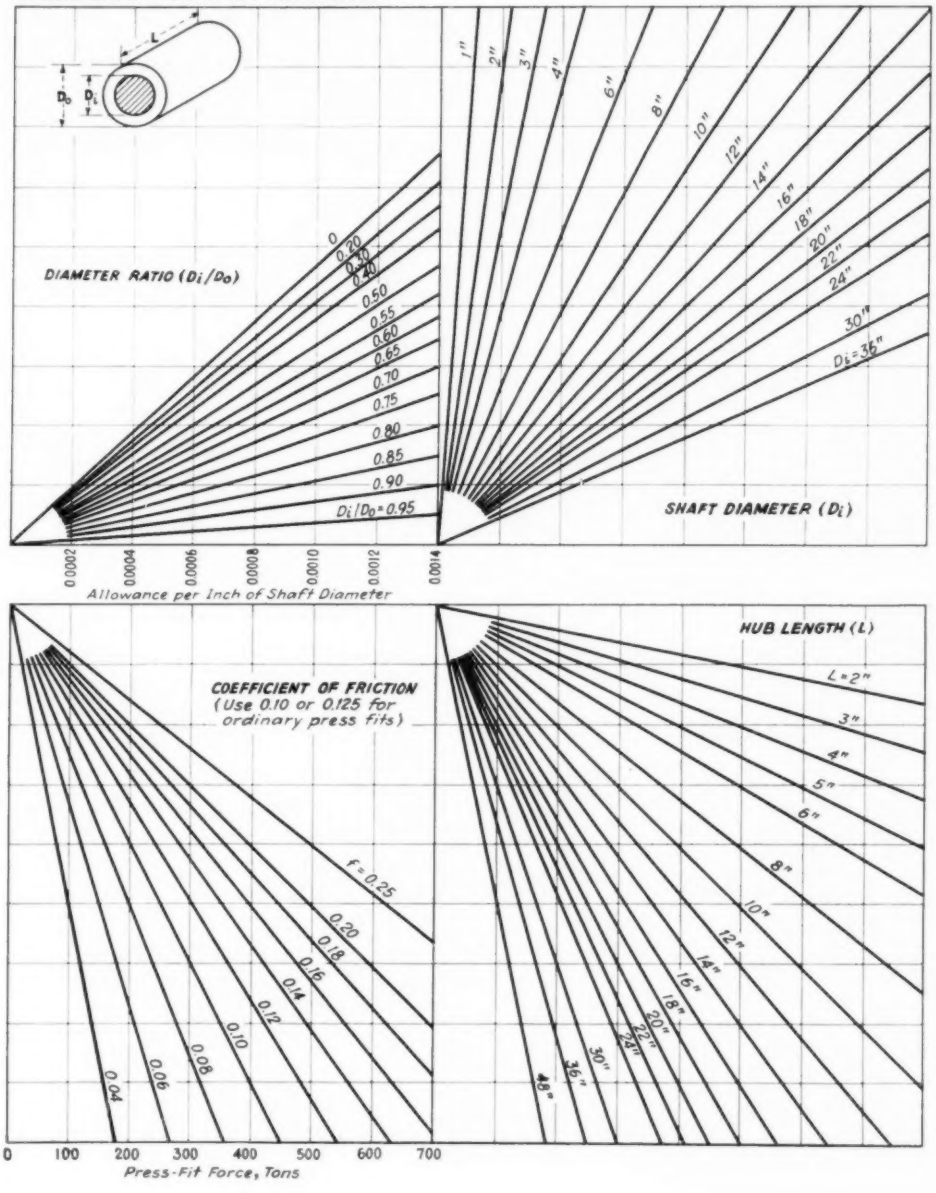
Export: The Armco International Corporation

ARMCO STAINLESS STEELS

ARMCO

Charts for Press-Fit Forces . . . III

STEEL SHAFT TO CAST IRON HUB



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The directors of your manufacturing company announce the regular quarterly dividend of 10% payable to stockholders of record . . .

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40% annual return on an investment in New Britain Automatics is commonplace

REPLACEMENT of old machines (even those in good working condition) with New Britain modern automatics frequently shows this or greater return on the basis of direct labor savings alone . . . with substantial extra dividends in overhead, recovery on equipment replaced and other factors.

The peculiar fact about modern machine tools as an investment is that the person who fails to make the investment is the one who runs the risk, because he endangers his ability to compete successfully.

Have you examined your equipment from this viewpoint recently? It's a simple process. Your New Britain representative with the help of our Estimating Department is available to assist you in analyzing your own machine replacement program.

We know you would benefit by having a talk with any one of the following sales engineers. Write, wire or call collect:

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Mr. F. H. Hastings
1853 Bluefield Place
Cincinnati 16, Ohio

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THE NEW BRITAIN MACHINE COMPANY
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NEW BRITAIN, CONNECTICUT

5491A1

TALKING SHOP

Pipe Filter

ALUMINUM WOOL is now available for cleaning aluminum, and for filters for heating and air conditioning. Carey Electronic Engineering Co., Springfield, O., makes it, and Sales Manager George W. Scott says the stuff makes a filter that will make a pipe smoke cool and sweet. If you smoke a pipe, Mr. Scott will provide a sample.

Frozen Plastics

CHRYSLER engineers undertook to develop a material for Alaskan barracks which could be flown in, erected in 5 hr. and would protect at -75F. They used a phenol-plastic-impregnated cardboard structure, faced on both sides with waterproof plywood. The sheet is even stiff enough to be used for floors, is also vermin- and moisture-proof.

Man as a Machine

A GOOD HEALTHY MAN, working a full 8-hr. day (are there such men?) can produce about ¼ hp. continuously, equal to the total heat of 1/3 pint of fuel oil—or so says F. G. Shoemaker of G. M.'s Detroit Diesel Engine Division. But the fuel oil only costs 2 cents, and the oxygen it burns in is free. By contrast, food for man runs $1 per lb. for solid fuel, $6 per 4/5 quart for liquid fuel. As an engine, man weighs about 700 lb. per hp.—making manpower pretty expensive.

On the other hand, man has one unique power as a machine— he has a built-in control (if it works) that beats anything anywhere else. Besides, he's a complete, self-contained, totally enclosed outfit, available in a variety of sizes and reproducible in quantity. The outfit is long-lived, has most major components in duplicate, is weatherproof, amphibious, runs on a wide range of fuels, has thermostatically controlled temperature, circulating fluid heat, evaporative cooling, sealed bearings, audio and optical direction and range finders, sound and sight recording, audio and visual communication.

Fire! Fire!

FELIX FIRE is the latest of the cartoon characters with which Stamford Division of Yale & Towne is wooing the readership of employees. Felix appears in "Confessions of Felix Fire," a feature article in "The Yale Panel," plant newspaper. He's the hot shot who loves fire—and he squeals on the people who help him in the plant and the unintentional methods they use. "Dolly Doorknob" and "Paddy Padlock" were earlier characters who described manufacturing procedures in their own production and stimulated pride of workmanship among employees.

Cat Selector

SELF-OPENING garage doors, operated by photo-electric cells, are fairly common around the homes of electronic engineers, but one G-E man has rigged up a special door to let the family cat in or out. The door swings freely when puss wants to go out, but to get in she must interrupt a light beam to cause the door to open. Here comes the new twist, however: The light cell is carefully calibrated to the color of the cat's fur, so if one of her boy friends tries to follow her in, the door slams down and he goes home to nurse a sore nose. Casual visitors can scratch in vain; the door remains closed unless, of course, their coloration exactly matches, in which case the fur would probably fly.

Press Tricks

PART-CIRCULAR SLITS in a panel, as at a window cut-out in automotive stampings, spread under tensile stresses developed in drawing, and permit the metal to draw over window edges without tearing.

When making a severe draw at the edge of a panel try to put in a stiffening rib, or similar construction, at points where less drawing is required. This practice equalizes the flow of metal and avoids tearing.

A common blow-down line from drawing presses permits the oil and muck to be led to a trap at a convenient location, instead of being deposited on the sub-floor or basement floor.

Hobbing Jump?

GEAR HOBBING with high-speed steel is commonly done at cutting speeds akin to those used more than 20 years ago. Any small increase breeds trouble. But there are indications that a big jump in speed gets over this tough spot and opens a new and higher speed range which can be used satisfactorily. Anyway, plans are afoot to study the problem from all angles.

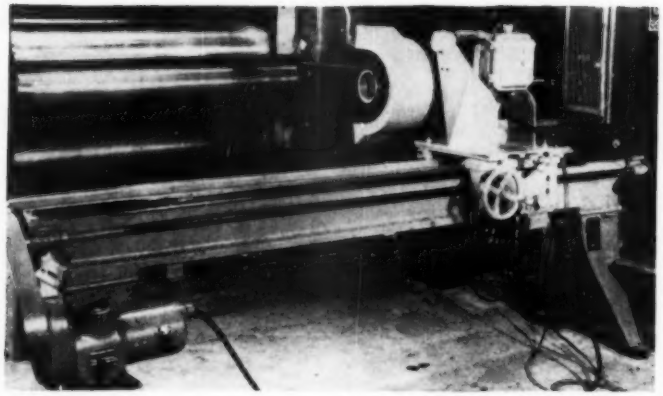
Carbide Saws

FOR SPECIAL JOBS, carbide saws are turning in good records. On one textile-machine manufacturing job, a carbide saw lasted 40 days, against 2 hr. for HSS. Such saws also slot screw heads, slit clock-hand hubs and such. For one hub-slitting job, the saw is only ⅝ in. in dia., has 42 teeth, cuts an 0.003-in. slot, and runs 40,000 rpm.

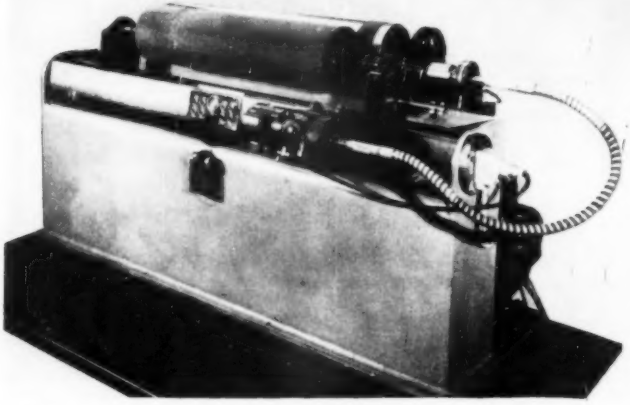
Daffynitions

WINDOW—what you play poker to do . . . LIE-ABILITY—a political asset . . . BARBER—man who does headwork with his hands . . . CORNERSTONE — device that delays the mayor's golf game . . . TACT—ability to describe others as they see themselves . . . COLLEGE EDUCATION—advanced training for getting into trouble intelligently . . . COMEDIAN —jestnut . . . PAY DIRT—hush money . . . SOMETHING—what most people expect for nothing.

New Shop Equipment



Rolls are shown, upper illustration, being ground by the In-Machine method. The machine is portable. Grinds are on a contract basis. Machine remains the property of Ryman. Lower illustration shows the Integral grinder that grinds rolls, taken from machines, by the "out-machine" application



Ryman Integral Roll Grinder Handles Large Work Using Abrasive Belts

Ryman Engineering Co., Ellwood City, Pa.

The integral roll grinder, based on a new grinding principle, has two applications. The "in machine" integral grinder can handle large calendar rolls, used in the manufacture of plastic sheeting, without removal from the machine.

Precision grinding enables sheeting to be turned out in thickness from 4/1000ths of an inch to $\frac{1}{8}$ in. with a degree of uniformity which can be measured in ten-thousandths of an inch. The "out machine" integral grinder operates where rolls are taken out of the machines and brought to the grinder.

Abrasive belts are the cutting medium. Changes in belts do not involve any balancing procedure as in the case of wheels. The integral grinder itself is dynamically balanced when manufactured. A wide range of belts can be handled. Rubber, copper and bi-metallic rolls which are difficult to grind with wheels can be ground to close tolerances, and a fine finish.

Ways of the machine are eliminated. It permits the grinding of heated rolls and the cylinders with no disturbance of grinder alignment. The absence of ways also eliminates the need for a massive bed which, coupled with the ease of alignment, permits field or "in machine" grinding of rolls and cylinders. Semi-positive infinitely variable traverse is used. Crowning or cambering can be performed. Although the grinder is not provided with an adjustable crowning mechanism, it can be supplied in a form which will grind crowns of specified magnitude or shape. The Integral grinder has complete insensitivity to vibration. It is said to produce a uniform and chatterless type of finish.

Alloy Developed by Driver-Harris Offers High Electrical Resistance

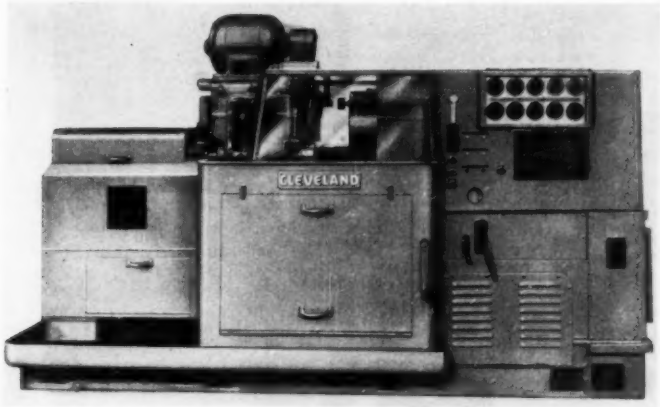
Driver-Harris Co., Harrison, N. J.

A new alloy called Karma offers unusually high electrical resistivity, and the ability to retain stable resistance values over wide ranges of temperature. At 20 C the specific resistance of Karma is 800 ohms per circular mil ft. This high ohmage makes possible small resistors with resultant desirable savings in space and weight.

In making potentiometers and resistance units such as radio, radar and other electrical equipment, there is a limiting minimum size by many resistance users, due to the lack of mechanical strength. With the use of Karma, however, it is possible to use a larger diameter of wire for the same resistance per foot due to its higher specific resistance.

The tensile strength of Karma is 130,000 to 180,000 psi at room temperature. Its coefficient of linear expansion is 0.000014 pc between 30 C and 500 C.

Materials and Parts



Dialmatic Automatic Screw Machine Features a Redesigned Main Guard

Cleveland Automatic Machine Co., Cincinnati, Ohio

The improved Dialmatic, Cleveland Model AB, 2½-in., single-spindle automatic screw machine, offers a redesigned main guard to permit easy access to the tooling and to facilitate chip removal. The front panel in the main guard can be lowered, forming a chute so that chips can be raked out of the pan directly into a container for quick disposal.

The extensive use of Plexiglas in the front and rear guards increase visibility in the tooling area. Plexiglas panels are hinged so that they can be raised out of the way of the operator or setup man. Also offered is an electric feed drive which makes independent and instantly variable forward and return tool feeds possible without cam changes for each of the five tool positions in the tool turret.

Forward and return feed settings are made by positioning ten dialed rheostats on the controlled panel. Quick-disconnect plugs are used to link all electric connections leading to and from the motor generator set.

Electric control table has been redesigned to make controls more accessible for maintenance and at the same time provide signal lights which aid the operator in running the machine. Two of these lights show direction of rotation of the spindle. Two others show whether the spindle is in fast or slow drive, and the remaining two lights indicate whether the machine is in feed or rapid traverse.

Time required to change single gears has been reduced by supplying U-shaped washers which eliminate the necessity of removing nuts which hold gears in place.

Panalarm Multiple-Signal System Utilizes Sound and Visual Alarms

Panalarm Products, Inc., 7218 North Clark St., Chicago 26, Ill.

Panalarms are multiple-signal and alarm systems with a broad range of use on process work, power plants and other applications

...INCLUDING

Induction-melting furnace with two chambers has automatic means to keep connecting channels free of oxide and slag.....page 144

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...and in MAY 19

Milling machine for cutting gears has table actuated by air and cam combination. Feed can be arranged to maintain a constant area of cut.

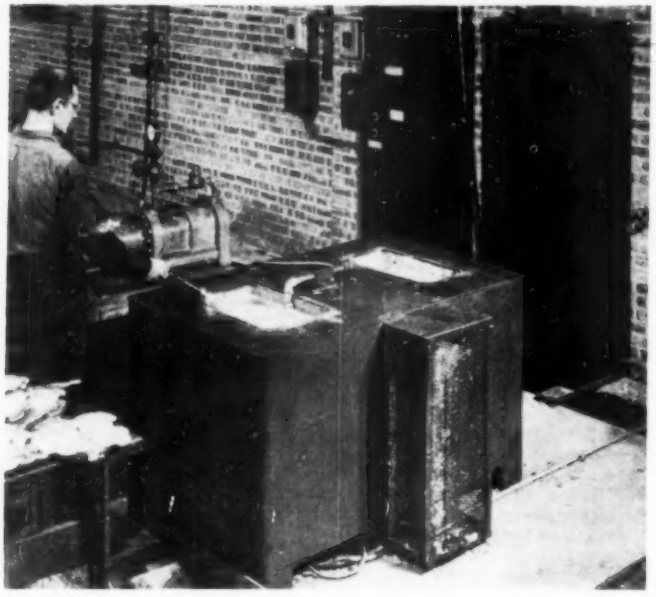
Steel furnished in cold-finished bars can be machined 10 to 25% faster than fastest standard free-machining Bessemer steel now in commercial use.

Mechanical presses, 50 to 800 tons, have speeds up to 250 strokes per min. Designed for stamping operations, they have welded steel frame.

where sound and visual alarms are required, to indicate failure or changes off normal.

The alarms are designed to make possible safety shut-downs, sequencing or inter-locking of plant operation. They can be actuated by any remote switch, thermostat, float-switch, or any type of equipment which can be reflected by an electric impulse to open or close a small relay.

Safety and reliability are insured by making the lamps glow dimly during normal operation. Two lights signal at normal conditions, and a warning is given by a horn, or other sound device. The horn is turned off, and the white light goes off when the failure is acknowledged by the operator. The horn is immediately back in service for monitoring any further failure. Thus, a single horn services any number of alarms. Panalarm cabinets are available in multiple units up to 12 in a single cabinet. Many combinations can be furnished.



Channel Flushing Offered in Induction-Melting Furnace

Lindberg Engineering Co., 2444 West Hubbard St., Chicago 12, Ill.

Channel flushing is a new development in induction-melting furnaces which keeps the channels between the two chambers clean and free of slag or oxide accumulation.

With channel flushing the primary coil of the furnace transformer is located in a manner to cause a greater volume of molten metal to be impelled into one chamber than the other. This raises the molten-metal level in the one chamber, and lowers the level in the other.

Every 60 sec when the power is cut off, the higher level subsides, and the molten metal flows to the other chamber until the same level exists in both chambers. When current is restored, the molten metal is forced in the opposite direction, again causing a higher level in the one chamber than in the other.

The furnace control equipment automatically interrupts the power once a minute, thus the channel flushing takes place twice a minute —once in each direction. The constant flushing, stirring and mixing action insures uniform analysis and is said to cause beneficial fluxing action. The flushing that occurs when the power is interrupted is the more important of the two flushings, as impurities and dross are released from the magnetic field surrounding the channels that connect the two chambers.

Cincinnati Shear Features Remote-Control Electric Clutch

The Cincinnati Shaper Co., Hopple, Garrard and Elam, Cincinnati, Ohio

The Cincinnati all-steel shear illustrated is shown with a remote-control electric-clutch attachment. The attachment is desirable when a large volume of wide or long plates and sheets are to be sheared.

The application of this remote-control device to a shear increases its usefulness by speeding the handling, decreasing man hours, and increasing the output of the machine. The electric clutch control is also furnished with two foot switches and a selector for single- or double-operator control. With double-operator control both operators must operate their foot switches before clutch will trip, thus increasing the output.

Logan 11-in. Lathes Offer 1-in. Collet Capacity

Logan Engineering Co., 4901 W. Lawrence Ave., Chicago 30, Ill.

The new Logan 11-in. lathes offer a 1-in. collet capacity for draw-in collets and center distances of 24 and 36 in. Over-all construction is considerably heavier. Logan pre-loaded ball-bearing spindle mounting assures sustained

accuracy at all spindle speeds from 45 to 1500 rpm without bearing adjustment.

Total spindle runout is held to within 0.0005 in., 12 in. from the bearing. The two V-ways and two flat ways of the heavier and more rugged bed are precision ground to a tolerance of 0.0005 in. along the lineal capacity of the lathe.

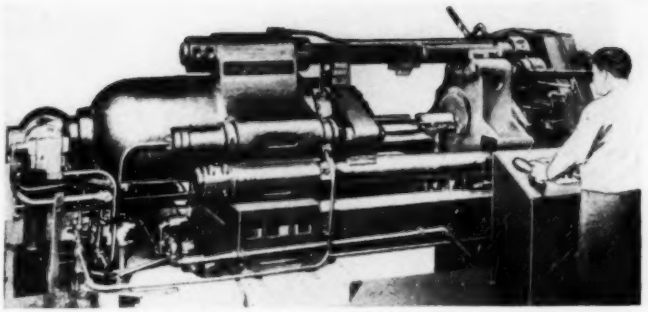
Self-lubricating bronze bearings protect against wear at points where bearings are not ordinarily used. Quick-change gear equipment provides instant selection of 48 threads and feeds. The 11-in. models are available in cabinet and bench types as well as the conventional floor types. Screw cutting 11-in. models sell at from $485 to $782 and turret models range from $735 to $965.

Wire Annealer Works Directly With Wire-Drawing Machine

Synchro Machine Co., 611 Sayre Ave., Perth Amboy, N. J.

A wire annealer comprises the application of resistance heating to nonferrous wire in its continuous passage from the wire-drawing machine to the reeler or take-up. The device is installed directly in conjunction with the wire-drawing machine. It provides for the production of bright annealed wire at maximum speed of the drawing operation. It is said to eliminate the hazards of tarnish, sticky non-uniformly annealed wire frequently obtained when wire is annealed on reels in the inclosed types of furnaces.

Called the Syncro-Cook continuous annealer, it is made in a range of sizes to provide for the continuous drawing and annealing of wire from rod breakdown machines to fine wire machines.



500-Ton Capacity Extrusion Press Is an Oil-Hydraulic Horizontal Type

Hydropress, Inc., 570 Lexington Ave., New York 22, N. Y.

A self-contained oil-hydraulic type extrusion press for rapid and economical production of rods and shapes from light metals and other non-ferrous alloys is built in 500- and 1000-ton capacities. A production of 50 to 60 billets per hr can be obtained from the press.

The fast-working press is designed for accessibility and quick change of dies. This makes it possible to limit production to extruding the shapes actually needed. The press handles aluminum and other light-metal extrusions such as window sections, ladder sides, trim moldings, ornamental and structural shapes.

Two Paragon Air Presses For Staking, Light Stamping

Paragon Metal Products, 844 W. Adams St., Chicago 7, Ill.

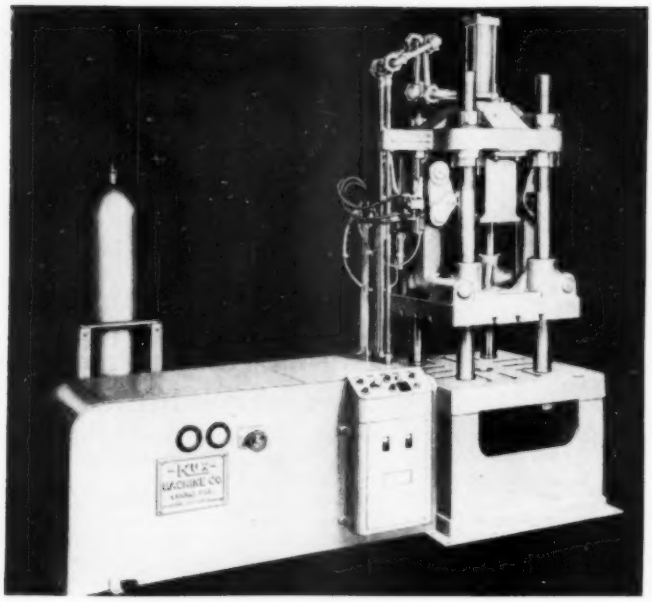
Two air presses are offered to increase production on staking, press-fit assembling, light stamping, marking and similar successive operations. The air presses feature a guided ram which assures die-like accuracy by maintaining relative position to tools mounted on base, instant ram return for high-speed production, a 4-in.-long side thrust, resisting bearing and a base with a long ground surface area to facilitate fixture mounting.

A 6-in. depth of throat is featured. Model AP-1 has a cylinder with a 4-in. bore and a power factor of 12.56 times line pressure. The cylinder of Model AP-2 has a 5-in. bore and a power factor of 19.63 times line pressure. The following specifications are the same for both models: 2½-in. stroke; ¾-in. ram, 6-in. depth of throat, and 7-in. table-to-ram height.

Automatic Start-Stop Control Made for DC Electric Welders

DV Welding Controls, Oakland 11, Calif.

DV automatic start-stop control for electric dc welders enables the operator to start welder by striking an arc without having to leave work. The control shuts off the welder after 2 min (adjustable) of no-welding. Running time of welder is said to be frequently cut in half, effecting changes in equipment wear and maintenance costs.



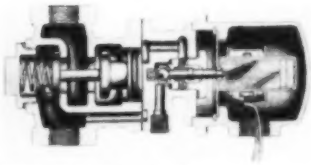
Kux Die Casting Machine Produces Parts with Inserts

Kux Machine Co., Chicago, Ill.

A vertical-type die-casting machine is offered for production of parts with inserts. The Model HP-22 has its die plates mounted in a horizontal position while die plates operate in a vertical direction, thus castings with inserts can be placed in the lower die half without difficulty and the inserts remain in place through the die casting cycle without falling out of their cavity placement.

Castings such as electric-motor rotors, flywheel and magneto parts having magnetic inserts, parts with bushings cast in, and others can be made on this machine. The hydraulically operated and electrically controlled model has a self-contained hydraulic-operating mechanism.

An injection-pressure multiplier is available for increasing injection pressures. The Model HP-22 will produce castings weighing up to 4½ lb in aluminum and has a die space of 17¾ sq in. between the bars. Vertical design eliminates costly die construction.



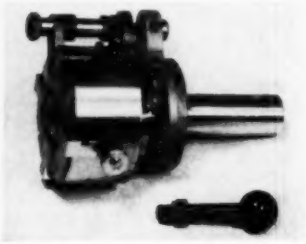
Ross In-Line Air Valves Handle Pressures to 125 psi

Ross Operating Valve Co., 120 E. Golden Gate Ave., Detroit 3, Mich.

Control of air power on machine tools and similar applications is provided by a series of Full-Flo in-line valves. A variety of sizes are available in both three-way and straight-way in-line models. The three-way is used for the control of single-acting cylinders, and the straightway for instant on-off service of either a plant-wide system or a single coolant line.

The ¼-in. to ¾-in. sizes are pilot type, solenoid operated, with the solenoid releasing the air power which operates the valve. Models can be furnished with inlet ports either normally open or closed. Standard valves handle vacuum as well as air, liquid, or gas pressures to 125 psi; special models can be supplied for use up to 450 psi.

For smaller requirements, ⅛-in. direct solenoid-operated valves have been designed. In addition, 1-in. and 1¼-in. models will also be available.



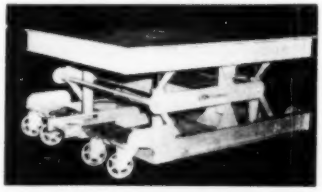
Geometric's Convertible Die Head Has a Built-In Aligning Shank

The Geometric Tool Co., New Haven, 15, Conn.

An aligning-shank Style DS convertible self-opening die head compensates for misalignment of machine and provides quick centralizing of die heads with work.

Over-all length of the new aligning-shank die head is practically the same as the standard style DS convertible die head. All other specifications are the same. Alignment is made by loosening two square head screws at the rear of the head, allowing the head to float freely.

A true running work blank is then threaded by slowly feeding head the full length to be cut. The machine is stopped and the two square head screws are tightened. The die head is then in proper alignment with the work spindle. Die heads are available from stock up to and including ¾-in. size.



HYDRAULIC ELEVATING TRUCK handles large cumbersome dies. The truck has a capacity of 20,000 lb and a 60x84-in. top. Four hydraulic cylinders provide a 16-in. range of elevation from 26 in. in the lowered position to 42 in. when elevated. The power-operated pump has a ¾-hp. motor which can be operated on an ordinary 110-v circuit. Truck has four 12-in. dia rear wheels and four heavy-duty 8-in. dia swivel casters. —*Lyon-Raymond Corporation, 1397 Madison St., Greene, N. Y.*

ANOTHER 3M COMPANY SERVICE STORY

THIS NEW STEAM *Ironing Attachment by General Mills instantly converts regular Tru-Heat Iron into handy steam iron. Big demand puts premium on speedy production.*

3M BELTS *finish the cast aluminum sole plates for the Steam Ironing Attachment faster and cheaper than the conventional method previously used.*

Belt Grinding licks "Loading", speeds soleplate output for General Mills

Cast aluminum particles "loaded" the previous abrasive equipment used to finish cast aluminum soleplates. Frequent resurfacing was necessary, and much time was lost by operators in the process. Then General Mills tried belt grinding. Results were immediate . . . belts turned out smoother finishes and stepped up production.

3M BELT GRINDING is a fast, tested method for putting smoother finishes on nearly any surface—metals, glass or plastics—done by a continuous abrasive belt running over a contact wheel especially designed for your particular type of job.

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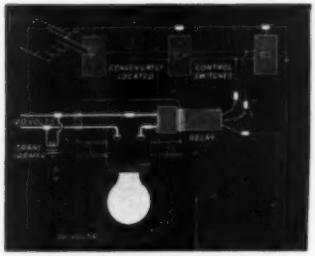


Remote Control System For Lighting, Appliance Circuits

Square D Company, 6060 Rivard St., Detroit, 11, Mich.

A low-voltage control system has been developed for the remote control of lighting and appliance circuits and is believed to have other applications in the industry. Alarm and signal systems, yard and night lights, and sensitive control elements on machinery are typical applications. One relay can be operated from any number of control switches located at different points, or several relays can be operated from one point by means of either manually or motor-operated master switches.

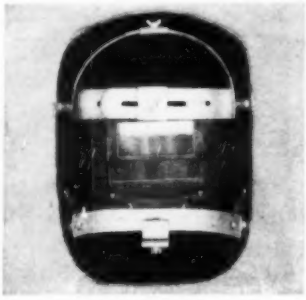
Cylinder-Block Gaging Machine By Sheffield Checks at Four Points

The Sheffield Corp., Dayton 1, Ohio

A cylinder-block gaging machine accurately checks each of the bores in the V-8 motor block at four different points. The operator manually stamps the classification for proper assembly. The specially designed Precisionaire is said to reduce inspection costs and improve quality by the elimination of the possibility of human error.

The cylinder block comes directly to the gaging machine on a roller conveyor where it moves into position on a turntable. It is locked in the proper locating position by hydraulically actuated shot pins. The operator then lowers the four gaging spindles into the cylinder bores by pressing the electrical "down" buttons to start the inspection operation. Should any of the spindles fail to enter the cylinder bores, a micro-switch will stop their downward travel instantly and signals, one for each spindle, show where interference is being encountered.

The spindles are then retracted, a safety feature that prevents damage to them as well as to the cylinder blocks. Each gaging spindle has four sets of air jets to make four separate checks in each bore. The position of the floats in the 16 glass tubes indicate if each bore is within the specified tolerance for taper and diameter. Float position of one tube in each group of four indicates the classification.

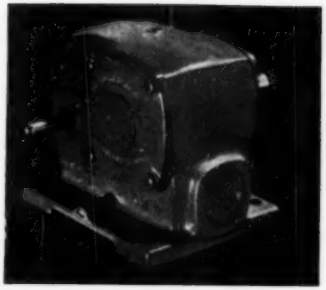


Welding Helmet Offers Movable Blinker Lens

Welders' Products, Dept. 92, 141 W. Jackson Blvd., Chicago 4, Ill,

A welding helmet offers a movable blinker-lens principle permitting the welder to lower and raise the filter lens without raising his helmet by a simple downward or upward movement of his chin against a pivoted chin strap. This leaves both hands free at all times, whether welding or not.

The helmet is constructed of vulcanized fiber and has been thoroughly tested under humid, dry and other atmospheric conditions. Its protective lens meet Federal specifications in all shades desired. Clear cover glass inside and out gives full protection. Head gear and chin rest are adjustable. The price is $11.95 each.



Double-Reduction Speed Reducer Is a Horizontal-Type Unit

Euclid Universal Machine, Inc., 15002 Woodworth Road, Cleveland 10, Ohio

The CW-2 double - reduction horizontal-type speed reducer has a ½-output-hp capacity with 1000-in. lb output torque, depending upon the ratio, the ratio range being from 10-1 to 3840-1.

The over-all dimensions are 8½x7x7½ in. high. Input shaft diameter is ⅝ in. and output shaft diameter is 1 in. Oversize shafts are available upon specification. Other features include aluminum-alloy housings, phosphor bronze worm gears, 20° pressure-angle gearing, ground thread worms and Timken roller bearings.

Turner Rubber-Tired Wheels Are 11x2 in. in Size

Factory Service Co., 4633 N. 21st St., Milwaukee 9, Wis.

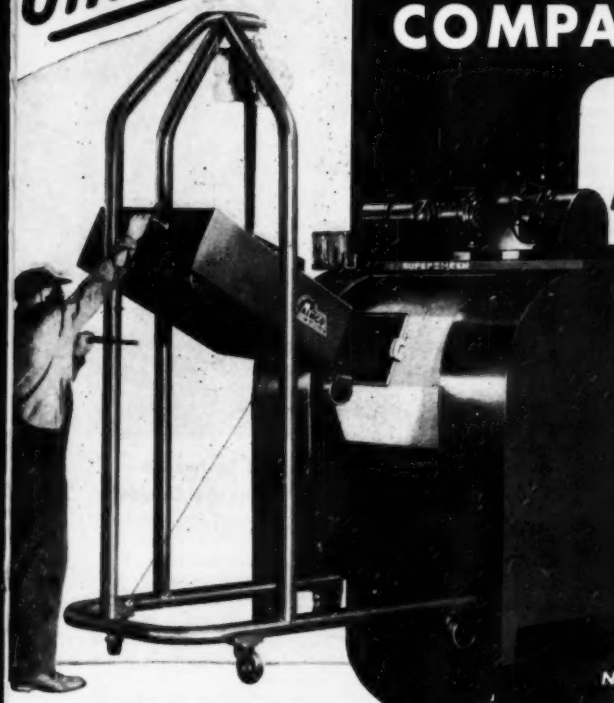
The Turner rubber-tired wheel fits on all mobile units of the Turner System of materials handling. These rubber-tired wheels are noiseless, sparkproof and long-wearing. They are 11x2 in. in size and consist of a 9-in. dia cast-steel core and a solid-rubber tire 1 in. thick.

The wheel fits a ¾-in. axle and is equipped with roller bearings and pressure-lubrication fittings. Trucks equipped with these wheels can carry loads up to 2400 lb.

Unmatched

NO OTHER BARREL COMPARES WITH THE

ALMCO **Supersheen** DB-200



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GREATER VERSATILITY—Infinite variable speeds from 6 to 30 R. P. M. (standard equipment).

MAXIMUM SAFETY — Roll-a-way perforated hood permits positioning of barrel with hood down. No protruding parts or door handles. Light colored barrel allows operator better working vision.

MAXIMUM EASE OF OPERATION—Positive magnetic brake allows inching to position. Quick opening and quick closing cam-operated doors (see below). Forward and reversing switch.

TROUBLE-FREE OPERATION — Sturdily built. Tested and proved under most severe conditions.

NOTE: Available with NEOPRENE lining or unlined.

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Case histories in wide variety of finishing applications show tremendous man-hour savings. Studies cover stampings, forgings, castings, machined parts of both ferrous and non-ferrous metals.

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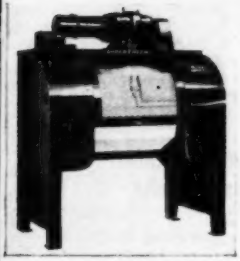
A vastly superior honing medium is combined with equipment specifically designed to give a superior "controllable" tumbling action. The result is *greater* accuracy, reduced surface porosity, *unmatched* uniformity and color, fewer rejects and *lowest possible cost.*



Roll-a-way perforated hood provides maximum safety and better operator vision.

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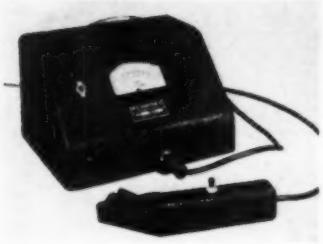


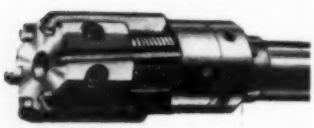
Merz Pico Surface Comparator Checks Surfaces Electronically

Merz Engineering Company, Indianapolis, Ind.

An electronic comparator checks surfaces against an approved sample and assures accurate meter readings. The Merz Pico surface comparator is compact and portable, and can be used on a production line without special accessory equipment or specially skilled operators. It is self-contained in an aluminum case, complete with carrying handle and storage drawer.

Over-all dimensions are 11x9x7 in. The unit weighs approximately 16 lb and operates from any 110 v, 60 cycle outlet. Readings are taken in 5 sec simply by pressing the head against the surface being checked, touching the actuating button and comparing the meter reading against the master reading.

A knife-edge meter pointer reads only one point on the scale, eliminating calculations or averaging. The area of exploration is said to be 500,000 times greater than with tracer methods.



Carbide-Tipped Adjustable Reamers Offer Replaceable Cutting Blade

Wendt-Sonis Co., Hannibal, Missouri

A line of carbide-tipped adjustable reamers feature replaceable carbide-tipped cutting blades. One piece of carbide backed with high-speed steel runs the full length of the blade. Cutting edges are diamond lapped. Threads are precision ground to permit close blade adjustment. The reamers are available in sizes from $\frac{5}{8}$ to 4 in. with straight or taper shank, or as a shell type reamer.

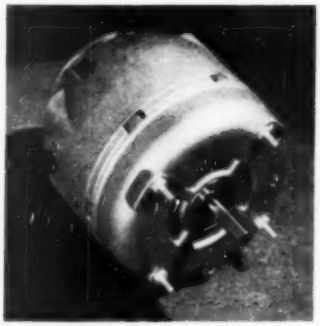
Precision Metallizing Process For the Renewal of Worn Parts

Bedford Gear and Machine Products, Inc., 200 Harrison St., Bedford, Ohio

A precision metallizing process is suitable for building a hard, wear-resisting surface on almost any metal part. Worn bearing surfaces, shafts, lathe spindles, mill rolls, concrete forms, valve stems, and other parts can be metallized and re-machined to original tolerances for reuse at a minimum cost.

The process is being used to repair blow holes in castings, provide a corrosion-resistant lining to plating tanks, make stainless-steel overlay on rolls of various types, and to change or repair the contours of molds.

In most instances sprayed metals wear from 300 to 800 percent better on bearing surfaces than the original metal. Metallized overlays in some instances can be made up to 3 in. thick.

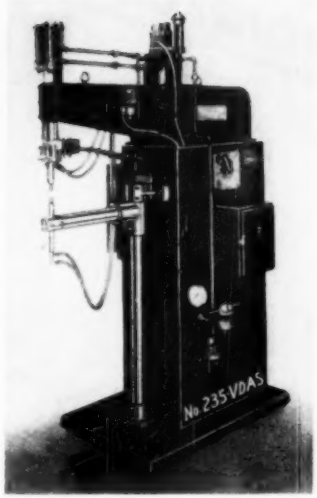


Unit Bearing Fhp Motors Designed for Portable Equipment

The General Electric Company, Schenectady 5, N. Y.

A line of unit-bearing, shaded-pole Fhp motors are designed for use on portable equipment. Designated as the Type KSP71, the motors are available in ratings of 1/40 hp, 50 or 60 cycle, totally inclosed; 1/25 hp, 60 cycle, totally inclosed; and 1/15 hp 60 cycle open. All ratings are available for 115 volts or 230 volts and for CW or CCW rotation.

The motors have a die-cast aluminum frame. Each of the three ratings can be used for horizontal or vertical shaft operation. Models are available in a variety of mountings, including shaft-end, opposite shaft-end, and resilient-base, to permit equipment manufacturers to select those best suited to their manufacturing facilities.



Eisler Press-Type Spotwelder Has Double-Acting Air Cylinder

Eisler Engineering Co. Inc., 750 South 13th St., Newark 3, N. J.

An improved press-type spotwelder is operated by a double-acting air cylinder. A solenoid-actuated four-way air valve controls the air supply to both sides of the air cyinder. It is said to work practically noiselessly.

The air system also includes an air-pressure regulator with indicating pressure gage, an automatic lubricator and an air filter. Electrode pressure is adjustable. Heat adjustment is performed by a heat regulator (7 steps on and 1 step off) with dial control, permitting handling of a wide range of materials and thicknesses. The built-in transformer is air-cooled.

Electrode holders are adjustable up to 24-in. opening between arms. Repeating strokes are possible up to 120 per min. The series 200 spotwelders are available in sizes from 7.5 up to 75 kva.

Govro-Nelson Special Machine Offers Drilling, Tapping Units

Govro-Nelson Co., Detroit, Mich.

A machine incorporating drilling and tapping units, performs several operations at once. The special machine is designed to drill, chamfer, tap-drill, and tap the hole for the adjusting worm of a wrench in 5 sec per wrench.

The four operations are performed simultaneously with a set-up employing a Govro-Nelson 6-station indexing dial, interlocked electronically with the units.

1/2 TON INVOLUTE SPLINE BROACH

produced by

DETROIT BROACH

Cutting section of this broach is made from the largest High Speed Steel forging ever produced.

This giant broach was produced by Detroit Broach Company to produce the 44-tooth involute spline in ring gears for truck rear axles. Measuring 84-3/4" long and 9-3/16" O.D., it is being used on a standard fifty ton horizontal broaching machine with a 72" stroke. The cutting section was bored out to reduce the weight and the pilot and shanks attached to it. (Forging weighed 2000 lbs. before machining.) The truck manufacturer reports that the production savings obtained will quickly pay for the cost of producing the broach.

Detroit Broach has the facilities and technicians to accurately produce any type or size of spline broach that may be required. Specializing in the design and manufacture of broaches and broach tooling exclusively they are thoroughly qualified to analyze your splined parts and then create tools that will economically produce them to required tolerances.

Call in your local Detroit Broach representative or write for one of our application engineers to call. He will gladly study your jobs and give you broaching cost and production data on them. You're sure to find that it's one way to cut today's manufacturing costs.

DETROIT *Broach* COMPANY

20201 SHERWOOD AVENUE

DETROIT 12, MICHIGAN

Detroit Broach has produced involute spline broaches as small as .125" hole diameter with five splines. Also producers of straight and spiral spline broaches, spline sizing and burring broaches, and all types and sizes of surface broaches and tooling.

Minitrol AC Portable Timer Offered as a 60-Min Unit

Wil-Mar Co., Box 1, Natick, Mass.

A portable 60-min ac timer is offered in a streamlined plastic case with dial and plastic indicating knob. The complete unit can fit comfortably into one hand and is available in red, green or ivory, complete with a 6-ft plug-in cord. The electric alarm buzzer and synchronous movement is built by Telechron, Inc. Price is under $5.

Larger-Size Electrode For Cast-Iron Heavy Castings

Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.

Eutectrode 24/49, in size ¼ in., is introduced to meet the need for a larger-size-diameter electrode for cast-iron heavy castings. The rod with special Frigidarc coating is adaptable for overlaying and repairing large turbines, pumps, and other castings requiring a heavier, more substantial electrode.

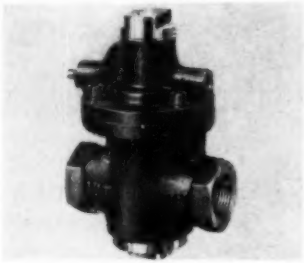
Eutectrode 24/49 is also available in sizes 3/16, 5/32, ⅛, and 3/32 in. for all types of cold-cast-iron welding, requiring no preheating or dismantling of equipment. The rod produces welds with tensile strength of 50,000 psi and Brinell 150-200.

Dix Universal Joints Are Concentric Within 0.0005

Lovejoy Flexible Coupling Co., 5001 W. Lake St., Chicago 44, Ill.

The Dix precision-built universal joints are guaranteed to be concentric within 0.0005. All rivets are ground flush within the body of the joint to permit working inside tubing or in close quarters. Joints are heat-treated to Rockwell 38 on C scale which permits working after heat-treatment.

Special alloy steel, hardened, treated and ground to the Dix precision factors, exceed rigid requirements of the U. S. government. On special order joints are Magnaflux tested and cadmium-plated. Large sizes can be equipped with Zerk fittings, as extras. Fourteen standard sizes from ⅜- to 4-in. hub diameter are made to Army, Navy and Air Corps specifications, or to user's requirements.



Ross Water-Saver Valve Offered to Control Coolants

The Ross Operating Valve Company, Detroit 3, Mich.

The Ross Water-Saver valve is offered for controlling coolants. The control is a straightway or shut-off valve normally open or closed to the water supply. It allows the coolant to run when needed but automatically turns it off between required periods.

A time-delay adjustment is set for maintaining the coolant flow for a period from 0 to 2¼ min. after the machine cycle. Operation of the valve is automatic requiring no electrical or mechanical motivation. It is generally activated by the same power which moves the machine cylinder. A pressure-booster modification is available for use when the cylinder pressure is less than the water pressure.

Sherwin-Williams Lacquer Gives Hammered Finish in Two Colors

The Sherwin-William Co., Cleveland, Ohio

The Sherwin-Williams lacquer Dimenso gives a hammered finish in two colors applied in one operation. The finish has been designed primarily for use by manufacturers who do not have facilities for baking. Lacquer Dimenso is ready to use as it comes from the package. It is applied by spraying and air dries hard in approximately 20 min.

Primers are considered desirable but are not necessary if the surface is properly degreased and cleaned. The finish is suitable for use on wood, metal or plastic surfaces of products that will not be subjected to high temperatures.

Chemlustre Finish for Aluminum Reduces or Eliminates Polishing

Chemclean Products Corp., 64 Sixth Ave., New York 13, N. Y.

Chemlustre is a finish for aluminum which substitutes a simple dip for polishing. It is useful for bringing aluminum articles to a highly lustrous semi-satin finish and is applicable to many jobs where pleasing appearance is required, but where mechanical operations such as polishing, etc. would be too costly.

In many applications where aluminum is to be anodized, several or all mechanical operations such as polishing, can be eliminated by the use of Chemlustre. The material involved in the process is an alkaline combination, white and crystalline in appearance. It is used in ordinary steel equipment, preferably with an exhaust system similar to that used in chromium plating. Two to 4 pounds per gallon of water are used. The luster of the work will depend upon the alloy and the time of immersion.

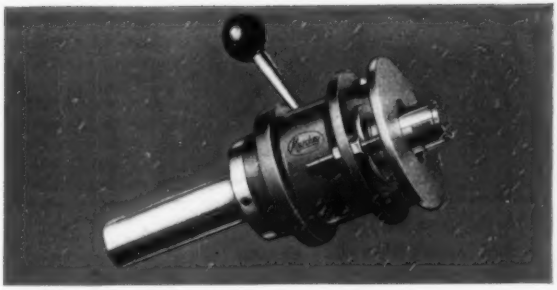
Thread-Cutting Broach Produces Chips in One Piece

The Shearcut Tool Company, Box 716, Reseda, Calif.

The Shearcutter thread cutting broach generates a perfectly threaded hole by a true-broaching action. Chips removed are curled up in one piece, and flow out of the hole being threaded, preventing interference with the cutting action of the broach and breakage due to clogging by chips. Low torque is required to form the thread which will average about 50 percent of that required for cutting threads with a standard tap.

MURCHEY COLLAPSIBLE MACHINE TAPS FOR

Speed, accuracy and economy



For lowest cost per thread, use Murchey type "L" collapsible machine taps. Tap is used with handle on turret lathe and hand screw machines, and without handle on automatic screw machines and drill presses.

A simple but accurate adjustment at shank end of body expands or retracts the chasers to exact pitch diameter. This adjustment can be made without removing the tool from the machine. Chaser size adjustment at shank end facilitates adjustment and increases service life. Chasers are positively retracted.

Chasers are easily replaced so that with one or more standby sets, the tool can be kept practically in continuous operation.

The type "L" tap is highly flexible. Body and nose piece are separate. Two tools with separate nose pieces provide a threading range of 15 basic sizes from 1⅛" to 6" in diameter. The nose piece is detachable so that several sizes can be used on each tool body. The sealed nose excludes chips and dirt.

● SPECIALS OF ALL TYPES

Special collapsible taps of various lengths having one or more pilots and other features such as reamers and boring tools can be provided for any special requirement.

Write for catalog

MURCHEY MACHINE & TOOL CO.

Since 1904

Lower cost per thread . . .

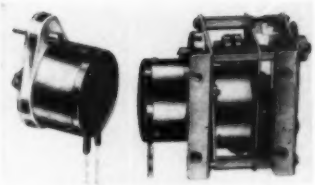
WITH MURCHEY TOOLS

MURCHEY

DAYTON 1, OHIO, U. S. A.

SUBSIDIARY OF THE SHEFFIELD CORP.

Manufacturers of collapsible taps, self-opening die heads (tangent and radial chaser types) and special threading tools



Redesigned Dc Timers And Motors Offered by Haydon

The Haydon Manufacturing Co. Inc., Torrington, Conn.

Redesigned dc timers and motors for timing applications are announced. The 9200 series dc motor is a low-voltage permanent-magnet type and can be built to industrial, Army, or Navy specifications. It is said to feature uniform torque and speed characteristics without the use of a mechanical governor.

The basic motor has a speed of 900 rpm at 6v, dc. A wide range of output speeds is offered with standard gear trains. Actual output speed is affected by changes in voltage, temperature and load. They may be built to operate on dc voltage as high as 115 v.

The 5148 and 5149 series automatic reset timers utilize the 9800 series dc motors coupled to a magnetically operated clutch. The totally inclosed switch is rated at 10 amp 28 v dc. The series 5148 timer is non-adjustable and can be furnished with a wide choice of time delays or intervals. Series 5149 is adjustable over a wide range of timing intervals.

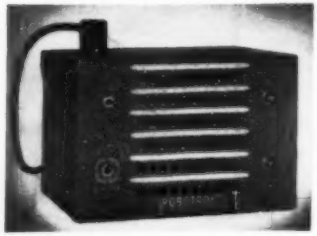
Tremco Chromated Metal Primer Dries to Touch in 10 Min

Tremco Mfg. Co., 8701 Kinsman Road, Cleveland, Ohio

Tremco quick-drying chromated metal primer is a priming treatment that makes it possible to apply two coats of metal in a single day. The priming coat dries to touch in 10 min and may be handled in 20 min. It can be re-coated in 30 min to an hour under average conditions of temperature and humidity, even with coatings containing strong solvents without danger of the primer's lifting or blistering.

The priming coat seals the surface from moisture and also prepares the metal surface for paint or enamel. The metal primer is a Bakelite type of coating such as has been used widely on all types of aircraft. It does not require oxidation to dry, but dries by evaporation of the solvents which forms a tough inert film which retains its flexibility.

The primer has adhesion to light metals as well as to steel, and is resistant to salt spray, moisture and corrosive atmosphere. It is furnished in both red and natural gray and can be applied by either brush or spray.



Robotron Control Unit Offered for Hydraulic Presses

Emmet Machine & Mfg. Inc., 2249-1, 14th Street S.W., Akron 14, Ohio.

The Model No. 140-X Robotron control unit is designed to perform automatic bumping (breathing) operations on hydraulic presses. The control unit can be set to give from 1 to 40 bumps during any one cycle of operation as well as to control the over-all cure time. This model is equipped with three built-in time arrangements, any one of which can be selected by the flick of a switch.

The unit is wired for use with limit switches to regulate the amount of press opening during the bumping operations, to close press after a predetermined time, and to hold the press closed until the next bump. A range of 21 different cure times is provided for each setting of the time range switch. Bumps can be timed to be either alternating or consecutive, as required. This model is recpmmended for processes where changes of cycles or molds are common and where complex bumping combinations are necessary.

Lo-Hi Metal-Cleaning Process Prepares Metals for Plating

Northwest Chemical Co., 9310 Roselawn Ave., Detroit 4, Mich.

An improved Lo-Hi process for the preparation of metals for plating and vitreous enameling is a two-tank procedure. It removes soil of all types, regardless of the quality of the steel, and activates the surface of the work conditioning it for a ground coat. The process dissolves light surface rust and softens scale and welded sections. Cleaning cycle is 5 min in each tank with no intervening rinse.

Severance Carbo-Mills Are Solid Carbide in One Piece

Severance Tool Industries, Inc., 726 Iowa St., Saginaw, Mich.

A series of carbide cutters called Carbo-Mills have $\frac{1}{8}$-in. dia. shanks and are made of solid carbide in one piece, cutting heads and shanks being integral. There are 12 different shapes in this series, chosen as the most popular, and to meet the widest range of applications for this size mill. Carbo-Mills can be used for production deburring and machining of parts made from materials that are abrasive or tough or having hardness up to 60 Rockwell C.

Cesco Cup-Type Goggles Have Thermoplastic Cups

Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12, Ill.

A cup-type goggle offers molded thermoplastic cups. Cups are engineered to fit left- and right-eye areas snugly yet gently, and have broad contact surfaces which eliminate pressure spots. These lightweight goggles offer molded-rubber Comfort-King headbands, said not to kink, or twist, and which have no buckles or sharp edges.

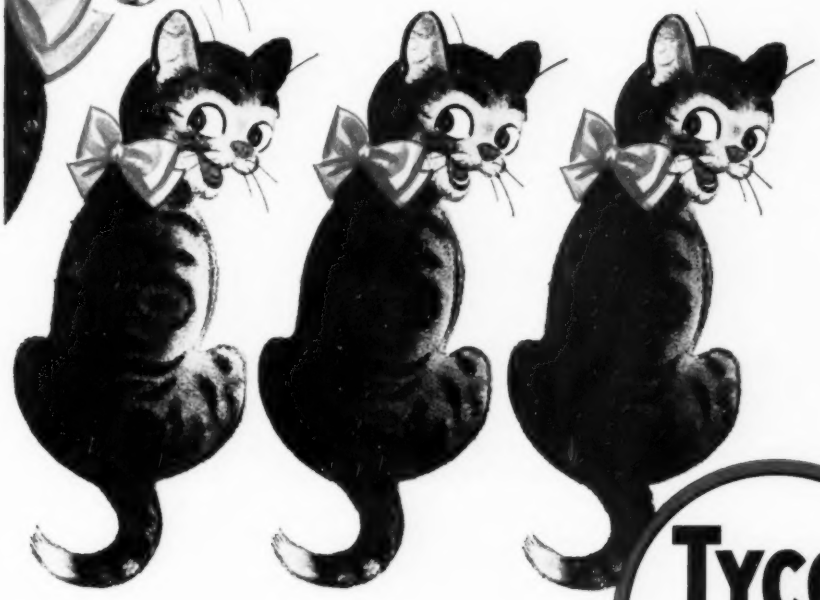
Ersin Non-Corrosive Flux Available in Liquid Form

British Industries Corp., 315 Broadway, New York, N. Y.

The non-corrosive Ersin flux is offered in liquid form, and is a high-grade homogenously activated water white rosin, said to have a vigorous fluxing action, but not to affect the non-corrosive features of the original rosin.

The flux reduces the surface tension of the molten solder, causing it to wet metals rapidly and thereby increasing the speed of soldering. The flux leaves nothing but pure rosin on the work after soldering. No objectionable odors are emitted.

*UNIFORMITY



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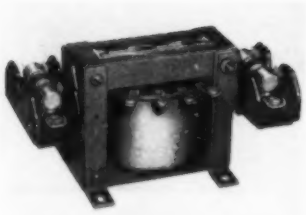
REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL



Square D Control Transformers Offered in 50- to 500-va Sizes

Industrial Controller Division, Square D Co., 4041 North Richards St., Milwaukee 12, Wis.

A line of control transformers are designed specifically for use with industrial control equipment which is characterized by high, momentary inrush currents to the ac operating magnet coils. To provide secondary circuit protection either one- or two-fuse and bracket assembly units can be mounted directly on the transformer.

The Class 9070 Type A control circuit transformers are available in 50, 100, 150, or 300 va at either 50-60 or 25 cycles and 500 va at 50-60 cycles, with primary voltages of 220-440 (dual voltage), 550, 440, 380 and 220 and secondary voltages of 110 or 24 volts.

McGill Portable Service Light Features a Concentrating Lens

McGill Manufacturing Co., Inc., Valparaiso, Ind.

The No. 505 all-purpose portable light features a concentrating lens which multiplies useful light, and a universal mounting which permits aiming the light where it is most needed. Additional wide-area illumination is provided by the half-round reflector.

Light measurement tests have shown the concentrated light to provide 6½ times as many footcandles at 2 ft as a plain bulb. This makes the 505 especially serviceable at close range. The universal mounting permits adjustment through a full circle horizontally and 270° vertically.

Rust Inhibitor Paint Applied by Brush, Spray, Dip

Al-Tex Products Co., 1900 Euclid Ave., Cleveland, Ohio

"End-O-Rust" paint has a very low acid value and a low oxidation rate. It is said to withstand extreme conditions of expansion or contraction and corrosive elements. "End-O-Rust" is formulated in type No. 1 for inside use, and type No. 2 for outside use, and can be applied by brush, spray or dip. Coverage is approximately 600 sq ft per gal. and it is available in a variety of colors including white and clear.

Heavy-Duty Screw-Machine Drill For Screw, Chucking Machines

Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.

A heavy-duty, spiral-fluted, carbide-tipped drill is designed for hand and automatic-screw machines and chucking machines. The drill fills the need for a low-cost carbide-tipped drill in standard sizes running by 64ths from 3/16 to ¾ in. It is made in short lengths, 3 in. on the smaller diameters, to 6 in. on the larger, and can be used in any application where jig bushings are not required.

Tahlen No-Bounce Hammer Absorbs Rebound in Loaded Head

Tahlen Metal Industries Limited, 681 East Hastings St., Vancouver, B.C., Canada. Distributed by H. F. Soderling Co., Seattle, Wash.

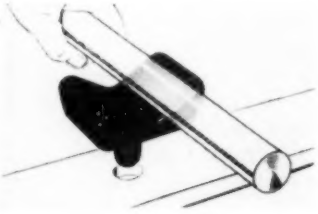
A No-Bounce hammer is said not to rebound from solid or flexible work. It features a head loaded with angular steel grit. The hammer absorbs the rebound, giving a dead-weight blow. Produced in a 1-lb model, the hammer has Tennite II plastic driving tips which are replaceable. The head and ferrule are of tubular seamless steel, and the handle is hickory.

Microscope Illuminator Designed for Laboratory Work

American Optical Co., Southbridge, Mass.

A microscope illuminator designed for routine and advanced laboratory work is the Spencer No. 735 lamp. The lamp furnishes both Kohler and parallel illumination for bright field and phase microscopy, photomicrography, microprojection and dark field illumination.

All adjustments are external and located for convenience. Ventilating fans on the die-cast aluminum body, coupled with natural draft ventilation, assure cool operation. A G-E 100 watt, 115-volt bayonet-base bulb is used. The new Spencer No. 735 microscope illuminator can be obtained with or without an iris diaphragm which has both a knurled ring and knob adjustments. A single-filter holder for either ground or blue glasses is available, also a multiple-filter holder attachment which accommodates up to four rectangular filters simultaneously.



Unbreakable Anode-Rod Support Covered with Semi-Hard Rubber

Automotive Rubber Co. Inc., 8601 Epworth Blvd., Detroit 4, Mich.

A self-aligning unbreakable anode-rod support is made of nonferrous metal covered with tough semi-hard rubber. The pin of the support sets in a hole provided in the tank flange. The support pivots to compensate for misalignment and will support excessive loads and rods up to 4 in.

An example of Penicillium, sp. Magnification 36x.

Are you interested in reducing machine "down" time?

Have you ever run into "sour" lubricants or coolants? Your nose will tell you when bacteria and mold are at work and your profits disappearing. Before that happens, control bacteria and mold with Dowicides—Dow's reliable industrial germicides and fungicides.

Bacteria and mold feed on grinding and cutting oils and coolants. When the emulsions go "sour," they must be thrown away. Now such losses can be reduced with Dowicides. Available in both oil and water-soluble types, they are ideal for incorporation in cutting, grinding, rolling and hydraulic soluble oil emulsions. Dowicides give effective protection against losses caused by fungi and bacteria.

Investigate Dowicides now. Find out how Dowicides can protect your profits from microorganisms. Complete laboratory facilities are maintained by Dow to help you solve your bacterial and mold problems. Contact your nearest Dow office or write direct to Midland.

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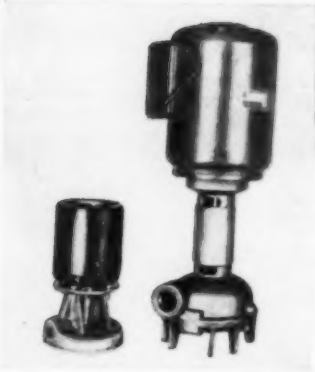
CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE



Centrifugal Pumps at 10-Ft Head Vary from 3.4- to 70-gpm Delivery

Graymills Corp., 2006 Ridge Ave., Evanston, Ill.

A new line of Superflo centrifugal pumps and pumping units range in size from 1/25 hp to ½ hp. Starting with the H-2225, illustrated, which delivers to 3.4 gph, the pump capacities go to 70 gpm at a 10-ft head. All are the immersion type.

The small model, left, is 7 in. high including its 1/25-hp motor. The inlet is through the top of the impeller housing and this allows the flat baseplate to rest on the bottom of the tank. The pump is designed for use in shallow sumps and for liquids of moderate viscosities. Operation is silent. There are no bearings below liquid level and no seals, hence the pump may be used with liquids carrying abrasives. The line of Superflos are available as pump and motor units only, or as complete units mounted in tanks.

Four Fluxes by Victor Offered For Brazing Cast Iron, Brass

Victor Equipment Co., Welding Equipment Div., 844-54 Folsom St., San Francisco 7, Calif.

Victor No. 3 flux is offered for brazing brass and bronze, steel, clean cast and malleable iron. The No. 5 flux is introduced for moderate heat brazing of cast and malleable iron, and can be used for tinning dirty castings. The No. 7 flux can be used for high heat brazing of cast and malleable iron where the base metal gets exceptionally hot. Also developed is the No. 9 flux for fast welding of cast iron. The flux is said not to cake when the container is subjected to moderately high heat. All fluxes are said to clean both parent and filler metal, and to cling to the heated rod when it is dipped into the flux.

Cylindrical Plug Gages Offered In Sizes from 0.025 to 0.510 in.

The Taft-Peirce Manufacturing Co., Woonsocket, R. I.

A line of reversible cylindrical plug gages offers positive locking action so that the plug cannot slip. The plug gages (AGD standard) are available in sizes from 0.025 in. to 0.510 in. both Go and Not-Go. They are furnished in alloy steel, high-speed tool steel, Carboloy or chromium plated.

Automatic Arc Stabilizer Reduces Radio Interference

Mid-States Equipment Corp., 2429 So. Michigan Ave., Chicago 16, Ill.

An automatic arc stabilizer offers a circuit and remote control which reduces radio interference resulting from high-frequency arc-stabilized welders. The control automatically cuts off operation when the welding arc is broken. A finger-tip switch mounted on the electrode holder is flicked on to resume operation.

The Missing Link automatic arc stabilizer can be used for all welding processes—metal arc, gas shielded arc, Heliarc, or spot arc. By automatically starting the arc, it eliminates the necessity of direct contact of the electrode with the workpiece to establish and maintain the welding arc. It also makes possible the use of any welding rod, ac. or dc. bare or coated.

Synthetic Rubber Compounds Resist Oil, Grease, Gasoline

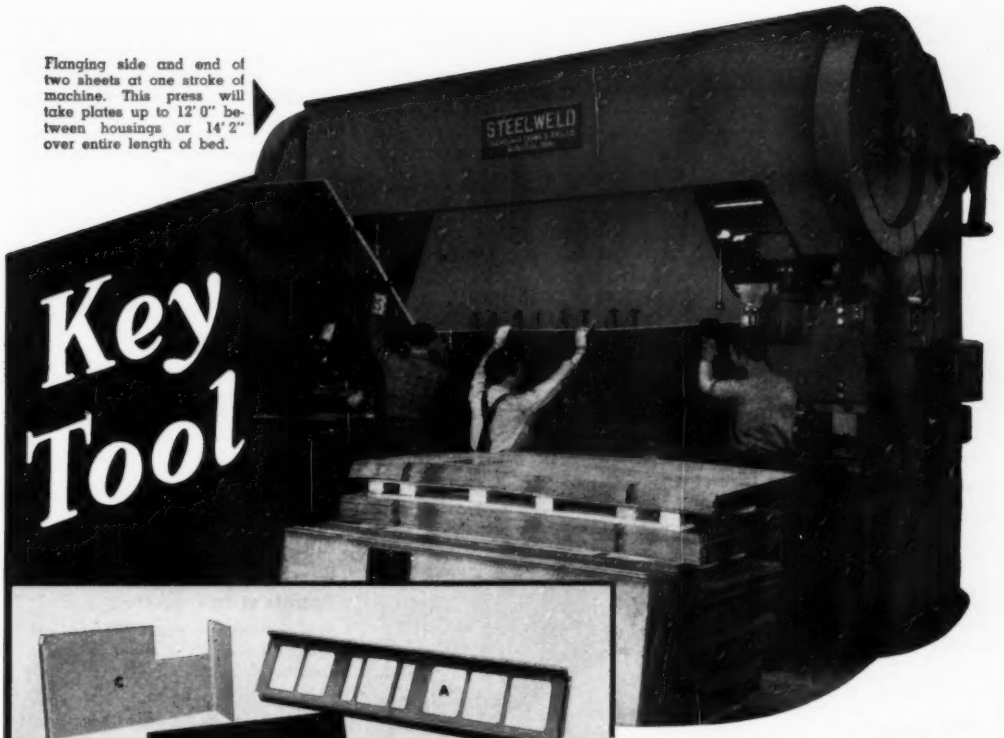
The Stalwart Rubber Co., 218 Northfield Rd., Bedford, Ohio

Synthetic rubber compounds have been developed to resist the chemical action of petroleum products, their derivatives and other industrial and commercial lubricants. Buna N, Hycar or Neoprene-based, the compounds can be fabricated into gaskets, sleeves, washers, tubing, molded products and extruded for sections.

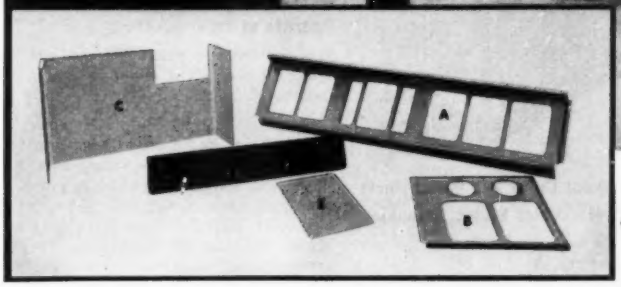
Rubbers having a tensile strength from 500 to 2500 psi, durometer hardness from 40 to 90, and elongations from 100 to 600% can be supplied according to specifications. The materials are capable of withstanding temperatures ranging from —60 to 225 F. Compounds are applicable to fuel lines, dust covers, filters, etc.

HORIZONTAL ASSEMBLING PRESS has an adjustable tailstock capable of resisting full tonnage. The 35-ton special horizontal assembling press is adaptable for assembling a variety of propeller stub shafts in tubes. Daylight is adjustable from 30 to 180 in. in increments of 3 in. Two 4-in. bore x 6-in. wide split steadyrests with locking levers can be adjusted to any spacing and clamped to the ways. An Oilgear Type DH-2017 two-way variable-delivery pump is direct connected to a 15-hp electric motor. Stroke is 18 in. Floor to centerline of ram is 27 in.—*The Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.*

Flanging side and end of two sheets at one stroke of machine. This press will take plates up to 12' 0" between housings or 14' 2" over entire length of bed.



Key Tool



A few of the many parts produced to close tolerances including braking, flanging, punching large openings and drawing: (A) capping of 18 ga. stainless, (B) capping of .031 stainless, (C) panel of 18 ga. Armco Paint Grip, (D) reinforcing of 14 ga. hot rolled, (E) evaporator bottom of 18 ga. Armco Zinc Grip.

IN MANUFACTURING SODA FOUNTAIN EQUIPMENT

A STEELWELD Model K5-12 Press is a key tool at Liquid Carbonic Canadian Corp., Ltd., Montreal, and has an important role in the production of ice cream cabinets, soda fountain equipment, tanks and containers.

The press is used for various parts made of metals such as mild steel, copper, monel, stainless steel and a number of alloys. The work includes bending, forming, beading (such as tops of stainless steel kettles with reinforcing rod inserted), punching large holes and drawing operations.

Parts are usually run through in small lots of 50 to 500. This necessitates frequent die changes, but because of the ease of doing this work on a Steelweld Press, little production time is lost. The machine is in operation 50 hours per week.

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CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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BENDING PRESSES

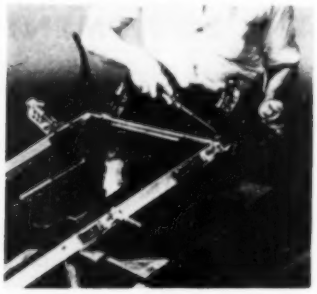
BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

Two Fire Extinguishers Made of Stainless Steel

Fyr-Fyter Company, Dayton, Ohio

Two fire extinguishers made of stainless steel instead of copper for both the 2½-gal. soda-acid type and the 2½-gal. foam type are five pounds lighter, making the extinguisher easier to lift and operate.

These new soda-acid and foam extinguishers carry the Underwriters' 500-lb test label instead of the conventional 350-lb test label. The polished finish is said to retain its luster longer. The Fyr-Fyter extinguishers are known as the Silver-lite 500 series.

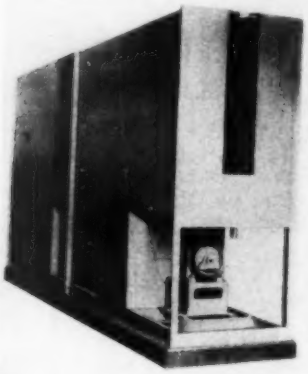


Thin Aluminum Sections Joined with Eutecrod 900X

Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.

Joining of thin aluminum is now possible with a low-heat aluminum welding alloy, Eutecrod 900X. Eutecrod 900X uses low-heat Eutector Flux 900X that supplants the common methods of aluminum brazing and fusion welding.

The unusually low heat at which the alloy is applied makes it desirable for manufacture of all light-gage aluminum parts, tubing, sheet, bands, and shapes without distortion. Eutecrod 900X is available in 3/64 in. and 1/32 in. in coil form. It bonds at 900 F and remelts at 950 F. It has a tensile strength of 300,000 psi. Direct contact of the heat source is not required so that all possibilities of warping or melting the base metal are avoided.



Mechanical Dryer for Metal Parts Leaves No Water Stains, Streaking

Optimus Equipment Co., 185 Water St., Matawan, N. J.

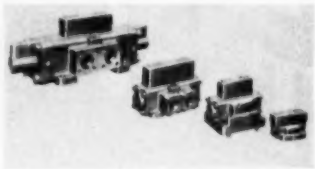
A mechanical dryer for the spotless drying of metal parts was originally designed to meet the needs of the plating industry for the drying of highly polished metal surfaces without water spots, stains or streaking. The dryers have been adopted for all types of drying of metal parts handled on monorail systems. Optimus Spotless dryers are designed to handle the drying of metal parts either on racks or monorails on a continuous-production basis. High-velocity jet nozzles, specially designed and located, reduce the drying time to a minimum.

GE Phenolic Molding Powders Offer a 1.37 Specific Gravity

General Electric Co., Chemical Dept., Pittsfield, Mass.

A group of general-purpose phenolic molding powders are wood flour-filled materials, priced an average one cent per lb below the market price of other general-purpose molding powders.

The four compounds, black and brown for compression and transfer molding, have a specific gravity of 1.37 and are said to have flow characteristics, cure time, and water resistance nearly equal to more costly wood flour-filled phenolics. Tests indicate that they are satisfactory for the majority of thermosetting plastics operations, although the materials do not have a high gloss on long-draw moldings and show a slightly less rigid discharge from the mold.



Directional Control Valves Operate at 2000 psi Max

Vickers Incorporated, Div. of the Sperry Corp., 1410 Oakman Blvd., Detroit 32, Mich.

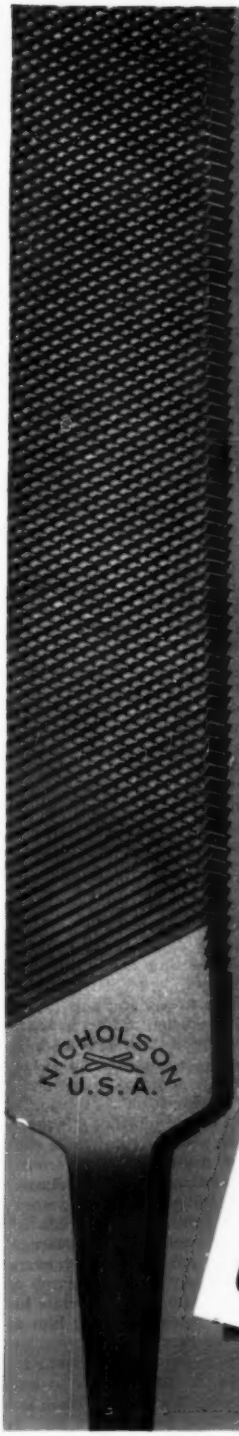
The series DG solenoid controlled 2-, 3- and 4-way directional control valves feature small solenoids, low inrush and holding current, and open, closed and partially blocked valving modifications. Many valving modifications, together with sandwich-type construction provide adaptability to most any directional control requirement.

Maximum operating pressure for this valve is 2000 psi. These valves are available for piping sizes from ⅛ to 1¼ in., and are arranged for either gasket or sub-plate (screwed-connection) mounting. Other models are available with flange connections, for piping sizes 1½, 2½ and 3 in.

Air-Dry, Baked-Type Finishes Stripped with Quaker Strip

Quaker Chemical Products Corp., Conshohocken, Pa.

New types of urea melamine, vinyl and bis-phenol finishes of both the air-dry and baked type can be stripped in less than five minutes without the use of special equipment. Quaker strip 15 is applicable to both new and old type finishes so that the necessity of maintaining a special stripping bath for either class of work is not necessary.



Besides stunning uniforms, Nicholson cartoon-type advertisements have helped to make "Nicholson" and "Black Diamond" the best known file brands in America. They have been appearing regularly each month in *The Saturday Evening Post* for the past four years.

Behind the Nicholson guarantee of *"Twelve perfect* files in every dozen"* are 85 years of experience in making files exclusively. Nicholson file-cutting machines and file-manufacturing methods are widely regarded as the most modern and efficient. Every Nicholson and Black Diamond file is designed, produced and tested to assure the best possible file performance and the longest possible file life. There's more satisfaction in making files that way, because we know there's more satisfaction in using them.

HOW TO USE AND TAKE CARE OF FILES *is elaborately covered in Nicholson's famous 48-page illustrated book, "FILE FILOSOPHY" (new up-to-date edition just off the press). How many copies for "key" users shall we send you? FREE.*

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(In Canada, Port Hope, Ont.)

★ A "perfect" file is one which is precision-straight, carefully balanced, uniformly hardened, accurately cut (with teeth of even height and sharpness), and made of the finest steel obtainable for the purpose.

NICHOLSON FILES FOR EVERY PURPOSE

What's behind this SWEEPING GUARANTEE?

a Nicholson file for every purpose

in industry, on the farm, and in the home★ *Twelve perfect files in every dozen*—GUARANTEED.

NICHOLSON U.S.A. and BLACK DIAMOND TRADE MARK

ALLEN TRU-ROUND DRYSEAL PIPE PLUGS

100% Pressur-Formd

This newest Allen ○ Head product, made of Allenoy steel, meets all the demands of a dryseal plug in applications involving extreme pressure, such as in refrigeration and hydraulic equipment. For use with dryseal taps. No sealing compound required.

It stands up under repeated wrenching as no plug has before. Its Pressur-Formd socket, unweakened by drilling and broaching, is so strong the key will shear before the socket strips.

Pressur-Formd threading insures metal-to-metal contact all the way by producing burnished threads. This method prevents distortion and nicked, imperfect threads which gouge softer metals and impair the seal.

Accurate fit is assured by 360° roundness, and by a perfect taper, at both the pitch and crest diameters.

Here's positive protection against the high cost of leaky or faulty pipe plugs. Get "Tru-Round" Dryseal Pipe Plugs by ordering genuine Allens in the distinctive black and silver box.

Now available in sizes from 1/16" to 1 1/4". No increase in price. Write us for samples and engineering data.

FOR NORMAL APPLICATIONS Our "Tru-Round" standard pipe plug, also Pressur-Formd, is leakproof, and a sealing compound is not ordinarily needed for pressure-tight joints. Precise roundness and smoother threads make for better seal. Threaded strictly in accordance with Army-Navy Aeronautical Specification AN-P-363. Fully guaranteed.

WARNING
Allen-Type screws aren't necessarily Allen-Made.
Get genuine "Pressur-Formd" Allen ○ Head screws in this black and silver box.

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MANUFACTURING COMPANY

Hartford 2, Connecticut, U. S. A.

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ALLEN ..... FOR 40 YEARS THE BUY-WORD FOR SOCKET SCREWS

ROUND TABLE Discussion

WORKING THE WILLING HORSE

Piling the work on to the man who shows initiative and ability above average is one of the greatest abuses practiced by inefficient management. Rush jobs reveal a condition of poor organization. Heaping the rush jobs on to the willing workman reveals a lack of knowledge of the elementary principles of psychology and the benefits derived from it are of a purely transitory nature, having no permanent effect on the wholesome future of the firm.

In very rare instances, the workman may derive some aesthetic satisfaction by being considered the speediest workman in the shop. He may be a type in whom the self-assertive and creative instincts are strongly uppermost. Being unfitted by education, or having some other mental gap which prevents him from becoming an executive, his ambitious craving for recognition is satisfied by developing his known skills to their maximum. But it is not in the nature of such an individual to tolerate the imposition of dirty work for long and he is very prone to tell the foreman to go to Hell, then pack his grip. The foreman will be the one to suffer, not the efficient workman.

Any machinist worth his pay has a wholesale contempt for rush jobs. Because some idiot in the order department, planning office or other section of the front office makes a rash promise to achieve an impossible delivery date, all the minions in the machine shop are supposed to operate the gear lever fitted to some part of their torsos and slip it into "high." Our efficient friend is at the same time expected to gird his loins in readiness to break a world record. It is generally assumed in the badly managed organization that prior to the advent of the job that is wanted sooner than possible, the whole staff of the firm has been loafing around like a fire brigade between alarms. The highly skilled and obliging workman knows this full well, his intelligence is usually above average, and when he gets the rush job every time he is likely to go in search of an employer who will appreciate his rare talent, instead of using him as an automatic machine.

The giving of rush work to one individual is sometimes likely to lead to unrest among other workmen not so gifted or skilled in the art. In

A Special Message of unusual importance to 2600 Plant-Operating Heads

YOU'LL WANT THE FACTS on this field-tested "TRIPLE C" Plan, if production machining is a factor in your operation

You'll find Carboloy's new plan of Coordinated Carbide Control ("Triple C") of real importance to your company's "break-even" position on expenses versus income.

It produces savings that go far beyond mere economies in initial tool cost—savings that are of unusual significance in the manufacturing cost of your product.

Plant-wide benefits that add up BIG

Are you vitally concerned over a high "break-even" point? "Triple C" has been *specifically developed* to help you lower it by:

- **reducing manufacturing costs**
- **increasing production**
- **eliminating waste of time and materials**

The "Triple C" Plan is a quick and positive way to help effect the kind of major savings that *interest you most* in these days of high fixed and variable costs.

It is a plan for *coordinating all phases* of carbide tool use in your plant. Years of field experience—under actual working conditions in *manufacturing plants*—went into its development.

Proof that "Triple C" is effective

Wherever it has been used, the plan has brought outstanding results . . . without increase in man-hours, without plant expansion, and without added major capital expenditure!

"Triple C" has worked wonders for other companies. It can probably be just as sensational a performer for your business.

Here is a typical case

"With fewer machine tools in operation, *production was more than doubled,* but cost per piece was not increased, despite a raise of 15.7% in hourly labor rate and a substantial increase in material cost."

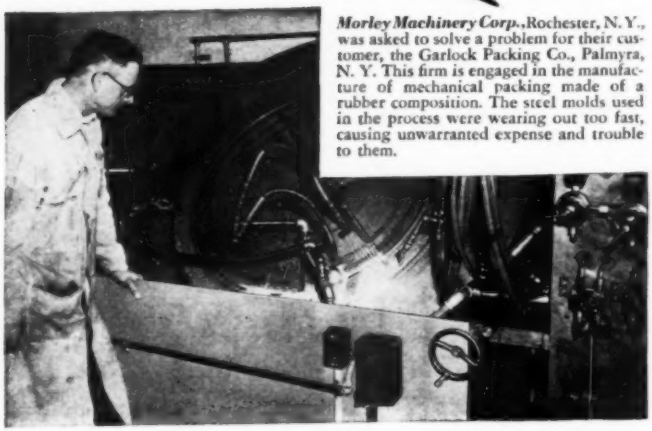
—Midwest manufacturer—
(Name on request)

CARBOLOY COMPANY, INC.
11149 E. 8 Mile Blvd., Detroit 32, Michigan

CARBOLOY®
CEMENTED CARBIDE

COORDINATED CARBIDE CONTROL
THE CARBOLOY "TRIPLE C" PLAN
FOR EVEN GREATER SAVINGS WITH CARBIDES

Flame hardened molds last longer... produce higher packing quality



Morley Machinery Corp., Rochester, N. Y., was asked to solve a problem for their customer, the Garlock Packing Co., Palmyra, N. Y. This firm is engaged in the manufacture of mechanical packing made of a rubber composition. The steel molds used in the process were wearing out too fast, causing unwarranted expense and trouble to them.

Harry Koerner and Steve Smith, Airco Representatives, worked with the Morley Company in devising a special oxyacetylene flame hardening operation to increase the service life of the molds. Two revolving, adjustable-speed table set-ups were used to accommodate symmetrical and circular steel surfaces up to 24 and 64 inches in diameter. Each set-up included three Airco flame hardening torches and tips for hardening the molds. Depth of flame hardening was controlled to about 1/16" on the lips and faces of each set of molds.

The Garlock Packing Co., expressed extreme satisfaction with the process; they found that the treated molds not only lasted far longer than before, but produced a higher quality of packing. This resulted in more economical service to the packing users.

TECHNICAL SALES SERVICE — ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

To assure its customers of high efficiency in all applications of the oxyacetylene flame or electric arc, Air Reduction has available the broad, practical experience of its nationwide Technical Sales Division personnel. The collective experience and knowledge of these specialists has helped thousands to a more effective use of Airco processes and products. Profit by this Airco "Plus-Value" service. Ask to have a Technical Sales Division man call today. Write: Your nearest Airco office. In Texas: Magnolia Airco Gas Products Company. On West Coast: Air Reduction Pacific Company.

AIRCO **AIR REDUCTION**

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strong trade-union shops, where all men are considered to be equally productive and all are given the same rate of pay, the high-speed worker is liable to cause considerable unrest and trouble unless he modifies his working pace to that of the majority. The writer has experienced this in Australian workshops where young and vigorous workmen have tried to relieve the monotony of their tasks by seeing how fast they could finish them.

The only way properly to reward the swift and obliging worker is to promote him. The fact that he turns out a greater volume of work with standard equipment shows that he has superior powers of concentration. His speed and dexterity reveal that he has a fine appreciation of motion economy. Since a lot of his speed is derived from the fact that he takes one cut where others take two, it is evident that he has mastered his machine and can confidently predict what it will do. An obliging nature, being among his attributes, indicates that he is not quick to take offense, he appreciates the responsibilities attached to the job and his diligence is evidence of his conscientious nature.

There is good foreman material in the "willing horse" type of individual, and it will usually be found that this type drifts around from plant to plant until he gets the responsible kind of job worthy of his abilities. It behooves any firm hiring such a man to hang on to his services, because the breed is getting rare and precious.

"Johnny Bull"
London, England

•

IS BUSINESS BUSINESS?

In the discussion regarding Smith and Thomas, I think if I were Ed and Al I would take a piece of paper and draw a line through the middle, put Thomas's name on one side and Smith's on the other. I would then put the good qualities of Smith under his name and do the same under Thomas's name. I would then count the score.

According to the facts as stated, both men were equally good workers, but there are several factors to consider not mentioned by Ed or Al. Which man had the best attendance and punctuality record? Which man got along better with his fellow workers? What effect would it have with the department in laying off Thomas or Smith? What about both men's background?

We must all recognize service and seniority and that would have to

Bunting Cast Bronze Bearings lend themselves readily to simple, clean design—only a straight shaft, a bearing of finely finished bearing bronze, a housing surrounding it and the oil film to insulate against noise and wear. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in principal cities.

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BRONZE BEARINGS • PRECISION BRONZE BARS • BUSHINGS

now **MARK** metal or plastic parts

faster

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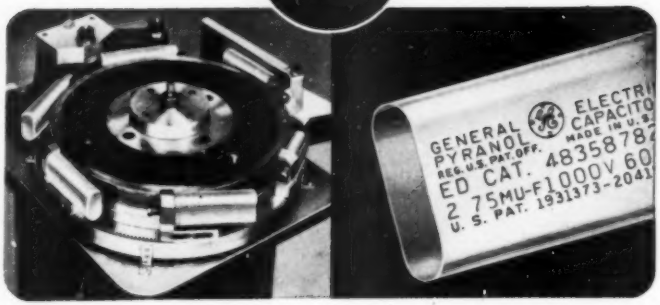
cheaper

with NOBLEWEST rapid production marking machines



Are you using modern methods and equipment for marking the products you manufacture? Right now Noblewest Rapid Production Marking Machines are helping many manufacturers to meet present business conditions by speeding up production—increasing efficiency—through faster, better marking at lower cost. For example, Model No. 286, shown above, is tooled for marking GE capacitors. The inscription, shown at right, being permanently *rolled in*, lasts as long as the product itself. Noblewest equipment can be used for marking metal, plastic, hard rubber, etc. Marking speeds are practically unlimited. Every Noblewest Marking Machine is engineered to meet your specific requirements, and backed by the skill, experience and facilities of the world's leading manufacturer of rapid production marking equipment. Whatever your marking problem, Noblewest engineers will be glad to make time and money-saving recommendations without obligation to you. A copy of our new catalog on Modern Marking Methods will be sent upon request. Write to NOBLE & WESTBROOK MANUFACTURING COMPANY, 17 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH NOBLEWEST

NOBLEWEST IMPROVED MARKING DEVICES

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count heavily in Smith's favor. I agree with Ed that what a man does and how he does it should be considered in any shop rather than what he does outside working hours. At the same time I can see Al's point of view in that the man who is interested in church affairs and a Boy Scout worker may make a good leader or supervisor. However, in checking over the good qualities under each name, Thomas would have to have more good qualities than Smith on account of Smith's seniority.

A. E. Salmons
Philadelphia 29, Pa.

•

The question is, which of two men, Smith and Thomas, should be retained—Smith because he has seniority but is single and not active in the community, or Thomas because he has a family, is a church member, is active in the Boy Scouts, and is active in the community?

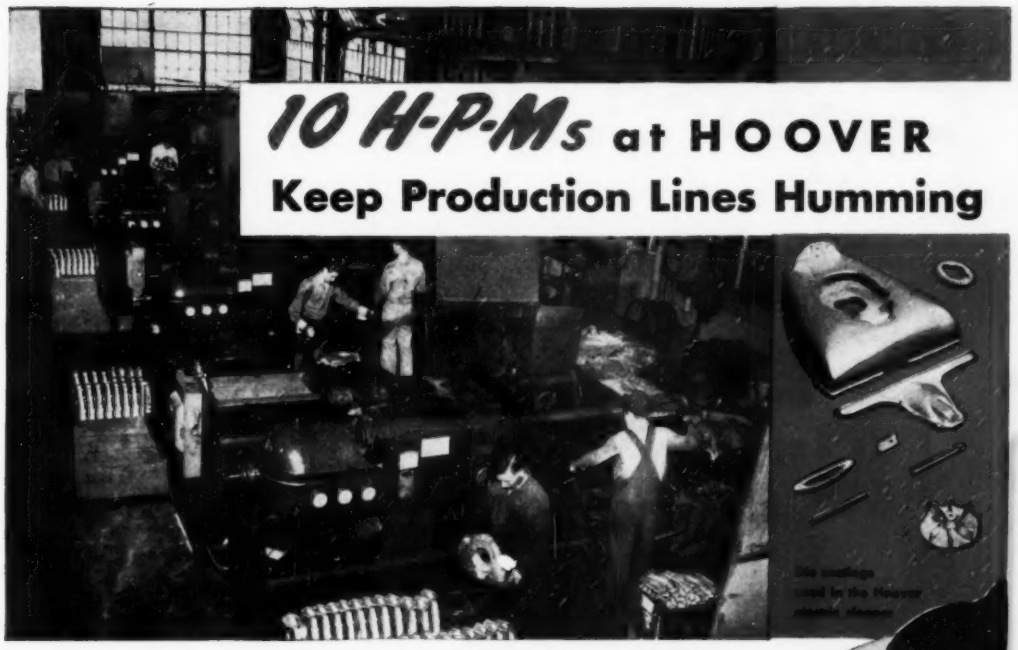
In my judgment all this has nothing to do with who should be let go. Smith has seniority. Both Smith and Thomas are good men. Then Smith should be retained due to longer service.

As long as both men are law abiding they have the right either to marry or stay single, or drink or not, join a church and take part in social activities or refrain from doing so. It is none of an employer's business as long as the man fulfills the duties he is paid for a good day's work.

If we were to set the line of demarkation between a good citizen and a poor one, determined by whether they took a few beers, or were guilty of gambling—backed a horse now and then, bought and sold stock and shares or took part in games of chance—we would have to exclude the vast majority of the people of the U.S.A. They wouldn't qualify under such rigid conditions, including thousands of church members.

I was employed for two years, 1903 to 1905, in an owner-superintendent managed plant. He was a big powerful man of 60 years old, drank, gambled, swore like a trooper, and never let it interfere with the job. He worked harder than any of his employees. He had about a dozen men who had served time in jail for various offenses. Some had been brought to him by social workers or ministers or Salvation Army workers, asking him to employ persons who, due to having been in jail, could not get work. That would help them in rehabilitation and so get them back on their feet and become

10 H-P-Ms at HOOVER
Keep Production Lines Humming



1

H-P-M die casting machines are the answer to production of intricate parts for Hoover electric cleaners as well as millions of parts that Hoover supplies to other manufacturers. Die castings permit greater freedom of design . . . better, more uniform, and lighter precision parts . . . and a decided savings due to high production output, lower material costs, fewer machining operations, less scrap.

2

H-P-M die casting machines are putting the "skids" under production costs in many companies where high priced material and labor are threatening profits. Why not take a tip from Hoover? Change to die castings. Let us show you how to make precision metal parts better . . . faster . . . cheaper with H-P-Ms. Two basic types of machines—(1) cold chamber, (2) submerged plunger, are available in a complete range of sizes. Call in a nearby H-P-M engineer to recommend the correct type and size for your job.

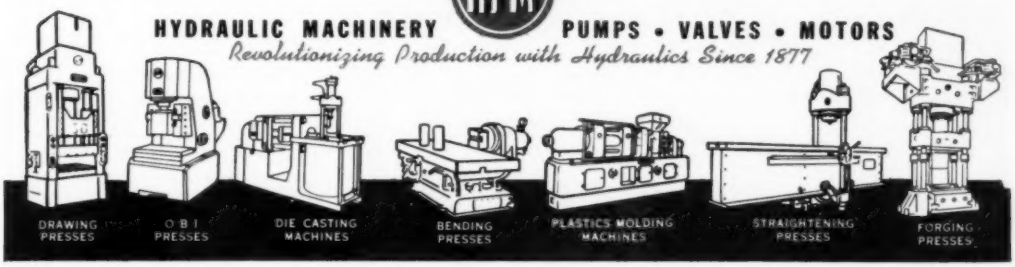
Just off the press—an authoritative article describing modern die casting practice. Write for your free copy today!

THE HYDRAULIC PRESS MFG. COMPANY **1002 Marion Road, Mount Gilead, Ohio, U.S.A.**

HPM

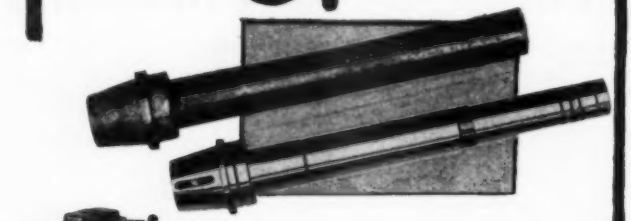
HYDRAULIC MACHINERY **PUMPS • VALVES • MOTORS**

Revolutionizing Production with Hydraulics Since 1877



ANOTHER CLAUSING QUALITY FEATURE
IN THE NEW SERIES 200 LATHES

Forged Spindles



The spindles in the Series 200 Clausing Lathes are forged to give you better performance. Hammered metal is stiffer, closer grained, stronger. Holds accurate alignment longer. After the forgings are machined they are heat treated and ground to precision limits. The tapered hole is also ground.

Model No. 210 $895.00
(Standard 8 speed drive)
Model No. 213 $1085.00
(Variable speed drive)
Prices without Taper Attachment.

There are many reasons why you should investigate the Clausing Series 200, 12" swing, 1" collet capacity lathes before making a purchase Fill out and mail the coupon below for circular.

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227 Richmond Ave., Ottumwa, Iowa.

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CLAUSING MFG. CO., 227 Richmond Ave., Ottumwa, Iowa
Please send complete literature on Clausing Series 200 Lathes.

Name _____
Address _____
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good citizens. He used to say he didn't give a damn whether a fellow had just come out of jail. As long as he could do the work required he would employ him.

That employer made lots of money, was a liberal subscriber to Salvation Army, all the regular churches and philanthropic societies, orphanages, but he could not be got to attend church.

Knowing that man intimately is one reason why I would not discriminate against Smith because he was not in the social life, church affairs, etc., and took a few drinks.

So when Al wants to fire a man because he does not enter into church activities and doesn't have a nice family and stays single he is, in my judgment, far outside the sphere of a foreman's duties.

If Smith's shopmates strongly resented Al's laying off Smith and had a deputation to Al's boss and an inquiry resulted into the matter, I wonder what Al's boss would have thought when Al informed him of the reason why he laid off Smith instead of Thomas. I believe that he would have informed Al that he was reinstating Smith and further, "in the future remember, Al, this is strictly a business institution and not the headquarters of the League for Public Service.

Arthur Silvester
Niantic, Conn.

•

You can't convince the rest of the workers who see an employee with more seniority and productive efficiency discharged, and a newer man with greater social graces or outside interests along community lines retained, that the company has their best interests at heart. As far as they are concerned, their jobs are also at stake and their retention depends on the whim of their employer. Basing layoffs on recognized seniority plus relative job efficiency gives the workers some sense of security and the willingness to continue efficient production. The manager of a modern enterprise has a responsibility, transcending all others, which he owes to his workers, as well as his company, to assure continued employment to the men who have cooperated with management through good times and bad.

As practical business men, most employers know that can't write a prescription to end business cycles or guarantee every worker a lifetime job. But there isn't a business in this country that can't find a way to give some greater stability to its employment. And that is where the adoption and use of a seniority system

MORE CAPACITY in LESS SPACE

with FAFNIR'S new line of heavy duty

PILLOW BLOCKS

Type LAO

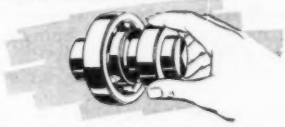
Incorporates the Fafnir Wide Inner Ring Ball Bearing with the exclusive self-locking collar . . . PLUS Mechani-Seals

Prelubricated . . . with provision for re-lubrication. Sizes for 1⅜" to 2⅝" shafts.

COMPACT, STREAMLINED DESIGN.

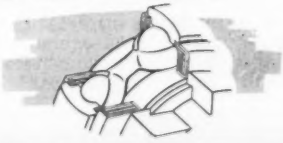
One-piece housing, reinforced at stress points for extra strength. Can be mounted in any position.

HEAVY SERIES FAFNIR WIDE INNER RING BALL BEARING WITH SELF-LOCKING COLLAR.



UNRESTRICTED SELF-ALIGNMENT IN ALL DIRECTIONS

MECHANI-SEALS PLUS integral synthetic rubber and felt washer. External slinger throws off contaminants.



Not only more capacity in less space but more ball bearing pillow block for the money. Write for full details. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

FROM
25-125
erratic threaded holes
per tap

TO
22,000
clean class 3 threaded
holes per tap

HERE'S HOW
HY-PRO DID IT...

PART: 18-8 stainless steel hex nut with *punched hole*

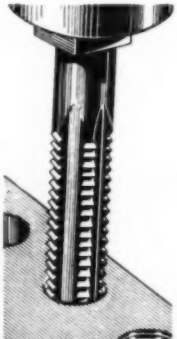
PROBLEM: Tapping with a 10-24 tap, a leading nut manufacturer experienced difficulty holding size and was troubled with excessive tap breakage.

Then They Called in the HY-PRO Sales Engineer

HY-PRO SOLUTION: His recommendation was a standard Hy-Pro 10-24 machine screw tap with one of the exclusive Hy-Pro surface treatments for wear and lubrication. Speed and cutting oil were adopted from extensive tables in Hy-Pro catalog. Production with Hy-Pro taps now averages 22,000 burr-free *Class 3* threaded holes at 62 nuts per minute.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.



Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

enters the employment picture. Security, represented by the steadiest possible job, is the first concern of nearly every working man. Security is a first concern of management and of stockholders too. Security is not and has never been the exclusive concern of labor leaders. When you convince your workers—by really doing something about it—that you are as interested in the stability of their jobs as they are, you'll have better and more loyal workers. Confidence of workers is something that management cannot win by studied effort or by public relations. It's something that develops. If a company provides steady year-in, year-out employment the worker will feel loyal.

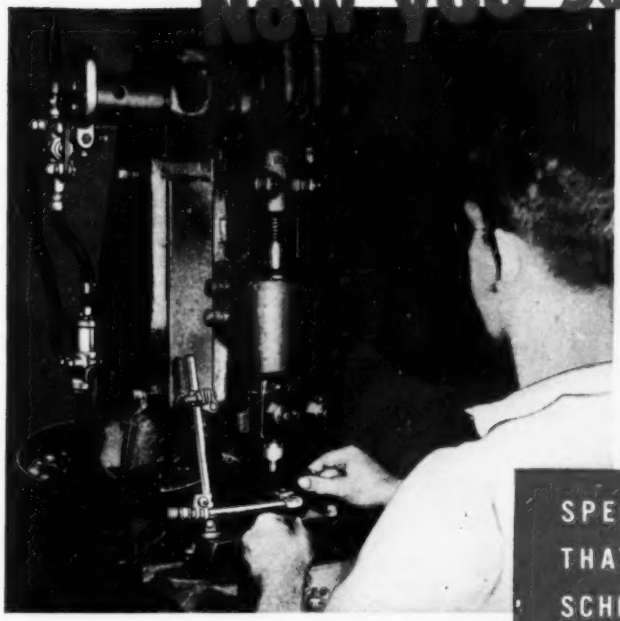
A man's business outside working hours is his own. When it comes to layoffs, the deciding factors should be his seniority and the relative efficiency of his work. Business should be entirely separate from sentimentality. A discharge system that takes into consideration the worker's efficiency on the job and his relative seniority is a more equitable method than one which attempts to inject personalities and outside interest into solution of the problem. It is best to provide for a procedure whereby the department head comes to the employment office and talks the matter over before discharging the workman. If such a procedure is followed there is always a possibility that the worker may be transferred to another portion of the organization, thereby saving the concern a portion of the investment in the individual. Taking seniority into account in establishing a layoff list indicates to the steady employee that the company puts a premium on faithful and conscientious work and serves to keep a dependable organization together to ride successfully over the dip in the business cycle.

Harry Kaufman
Philadelphia 26, Pa.

•

This question of who to lay off from work first is determined largely by employee unions these days, is it not? With such unions having so much influence in industry, management, at its discretion, is not even allowed to keep the most industrious and hard-working if they lack seniority, let alone keep on the payroll those who are the most social-conscious, or have the largest families. Is it not true that in a union shop, the union actually supervises the layoff, when this is necessary, making certain that the help with lesser seniority rating goes first? If the laid-off worker suspects that he has

Now you see it PUFF... and it's done!



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Magic in the way it solves ejection of WORK—ELIMINATES Mechanical Knock-out—No RISKY MANUAL removal of WORK. Magic in the way it conserves your air consumption. Magic in ease of installation.

The Standard Set produces a blast of short duration, timed by an adjustable cam suitable to eject work that is left lying on the die.

The Pilot Ejection Set enables you to deliver a blast of air timed with automatic shut off for ½ second up to as long as is required to remove the work. With this set you can eject work any time during the entire cycle . . . or after the part is carried up by the ram, such as in compound dies.

The saving of air is astonishing. Schrader Air Ejection sets are inexpensive; packaged complete, ready-to-install. They pay for themselves within a short time by air savings alone. There's a set for every need. Schrader will solve your ejection problems. Write for information and literature today.

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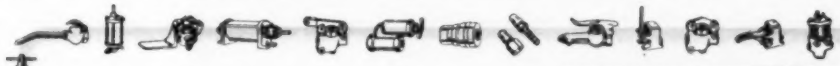

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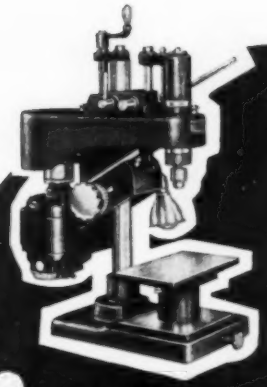


SMALL HOLE

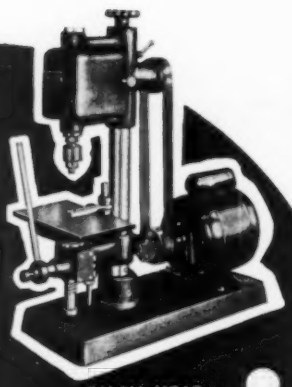
PRECISION DRILL

SUPER-SENSITIVE
VARIABLE-SPEED

The Hamilton Varimatic Drill has stamina. All of the stamina needed for hard, continuous production work. But it is also a tool of precision; built to extra close tolerances for the drilling of small, precision holes (.004" to 5/16") in materials as diverse as paper and monel or ceramic and bronze.

Speed is infinitely variable between 840 R.P.M. and 9300 R.P.M. Clearance from center of chuck to column is 5", from table to chuck, 9½".

Our bulletins V-47 and T-47 illustrate and explain these two precision machines in detail. Write for them!



SMALL HOLE

PRECISION TAPPER

COMPANION TOOL
TO THE VARIMATIC DRILL

SUPER-SENSITIVE

The spindle of the Hamilton Super-Sensitive Tapper idles in reverse, and thus may be centered without cutting. When pressure is applied to tap, direction of rotation changes and tapping begins. Release of pressure again reverses rotation and reduces speed to "idle" instantly and automatically, withdrawing tap from hole.

This feature, and the tapper's adjustable stops, make possible the tapping of blind holes to the very bottom without danger of tap breakage and in a minimum of time.

Capacity of the Hamilton Tapper is from the smallest and finest tap to 10-32 inclusive. Spindle speeds range from 1200 R.P.M. to 2600 R.P.M. Clearances; center of chuck to column, 3¼", and from table to chuck, 3¾".

THE Hamilton TOOL COMPANY

SUPER-SENSITIVE DRILLING MACHINES · TAPPING MACHINES · PORTELEVATORS

830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

lost his job out of turn, he can enter a complaint. This has given rise to the popularity of a term called "bumping." In this "operation," the complaining man looks for another job in the factory which he can do and on which someone with less seniority is working. The personnel department usually carries a list of jobs available, and seniority of employees. If such a job is found, the worker doing it is "bumped-off" the job. He gets laid-off and the complaining worker gets his job.

Labor contracts seem to have created this condition and the need for peaceful labor relations permits this situation to continue, and unless something is done, shall for some time.

E. Diskavich
Torrington, Conn.

•

Ed says, "We're running a shop here, Man, and it's what a fellow does and how he does it that counts—not outside effort."

Now that is looking at the subject in a cold steely way, in other words, he only gives to Caesar what is Caesar's and thinks nothing of the different stabilities of different men.

Take the case of Smith first: The first consideration is that he is a bachelor. If he is discharged, all he has to do is to pick up his chest of tools, walk out, and either get a new job in the same town or another one and go to work.

He is a "light drinker," but when a man says that he can drink or let it alone, he usually drinks . . . In most cases his "home" is a furnished room and he has nothing stable in the way of companionship.

These, in themselves, will create a tendency for him to go out among friends and acquaintances, many times in bar rooms. On Saturday nights, this may be emphasized so much that when he shows up for work on Monday, he has a hangover that doesn't help matters.

Very few drinkers are like an old man who lived near a small town in New York State. It was said that he would drink a quart of liquor without taking the bottle from his lips.

An old friend who had been away for some years, returned to the village and invited the old man to have a drink.

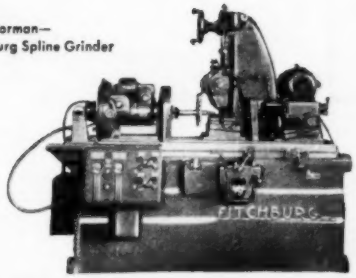
"No," he replied, "I don't drink."

His friend couldn't believe his ears.

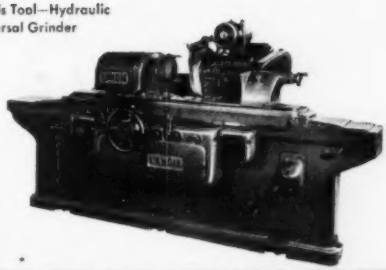
"Why not," the friend inquired, "Confess."

The old man smiled and drawled, "Well, you see it was this way; I drank for nigh on to 40 years and

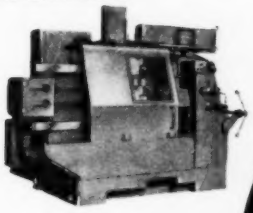
Van Norman—
Fitchburg Spline Grinder



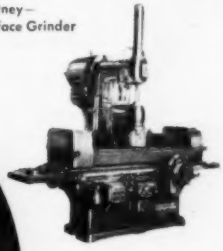
Landis Tool—Hydraulic
Universal Grinder



Bullard—
Man-Au-Trol Horizontal Lathe



Pratt & Whitney—
Vertical Surface Grinder



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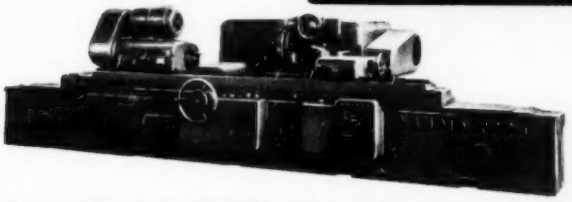
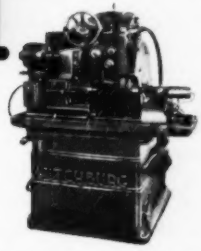
Landis Tool—
Hydraulic Cylindrical Grinder



Van Norman—
Fitchburg Special
Plunge-Cut Grinder



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HY-TEN *and* AISI

thought maybe it was becoming a habit, so I up and quit. Ain't had a drink in six or seven years."

Al should seriously consider Thomas; he is married, has a family, is an attendant at church and is active in boys' organizations.

If there is anything in this country which is needed today, it is attention to our young boys, and, in this way, Thomas is doing good work and he should be thoroughly respected for it. If he loses his job, he must try in every way to land another one in the same town because of his family.

No, there is more than shop life to be considered—and if Al is fair, he will keep the most deserving man.

Priority is not the only consideration. My experience has taught me this.

F. H. Stebbins
Worcester, N. Y.

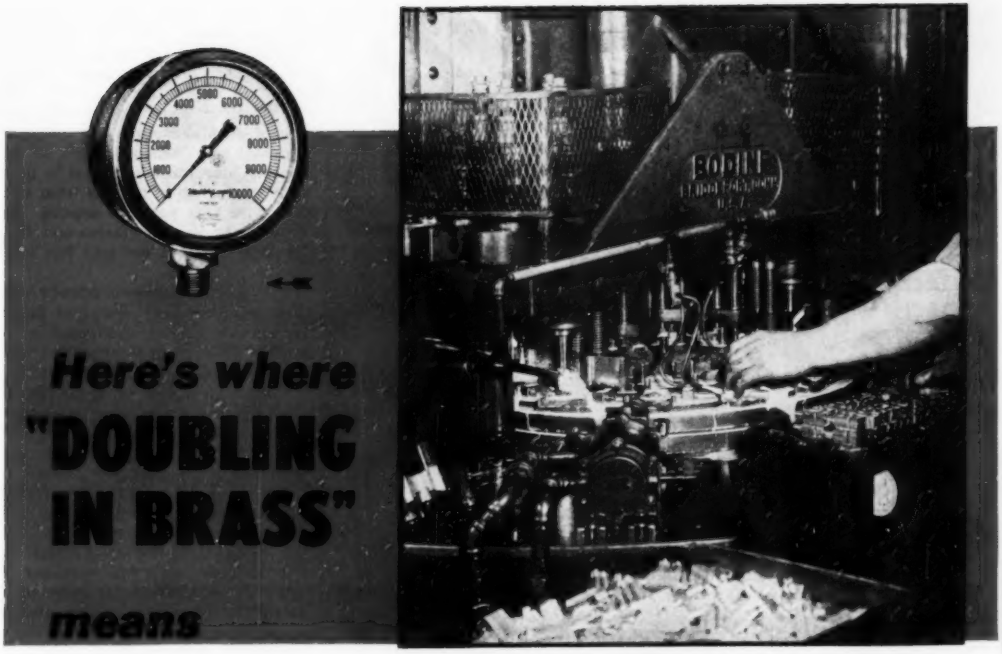
•

CLIQUE OR CLICK?

The question of limitation to the number of relatives to be employed in a department, plant or organization—or whether they shall be employed at all—is one question open discussion seems to have little chance of settling, at least on any wide scale.

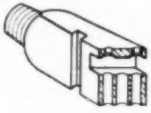
The "pros"—those with family interests in or with a concern—will always feel blood is thicker than water; after all who can gainsay it? Regardless of one's generosity or breadth of feeling towards his fellow man, if it comes to a decision between keeping Brother Bill or Joe Blow, merit alone won't govern. It's a strong bet that, unless Bill was hired only yesterday, seniority will be well circumvented. The same goes for in-laws, cousins and the rest—in fact there is all too much truth behind those jokes of the way the "little woman's" brother holds his job.

Those "agin" it are similarly bound by intangible bonds. As they are the exception rather than the rule, one example only comes to mind. At this writing, frankly, it is not known whether the ruling still prevails. In the early days of this organization, when the employees were few in number, the plant small, the "directors" young "working foremen," it was very easy, perhaps misguidedly so, to lay down a rule—"no relatives, regardless" and come what may adhere to it. Years passed, the firm grew—its officers in number and in age. They were specialists, therefore son followed father in the choosing of a career. However, where Papa "growed" into his eminence in his



DOUBLING OUTPUT... or more

...and when we say "doubling" we are extremely conservative. In this case 8 different holes were drilled . . . 2 also countersunk . . . in a Brass Gauge Socket. Production 700 pieces per hour from the machine, 5600 operations per 50 minute hour.



Brass Gauge Socket

Bodine automatic Drilling, Milling, Tapping and Screw Inserting machines cut costs almost unbelievably. We have one report of up to $200.00 savings per day on each machine of a battery . . . truly a worthwhile investment.

If you need repetitive production of small parts you need to know about Bodine multi-spindle automatics. Send for a Bodine Bulletin today . . . it pictures modern production at its best.

"You can't meet
Tomorrow's Competition
with Yesterday's Machine Tools."

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For Grinding Spline Broaches, prevents friction and galling.
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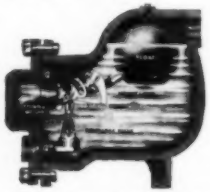
On the basis of their service records, leading plants are increasingly standardizing on these Nicholson units. For details, send for the individual bulletins listed here.

NICHOLSON EXPANDING MANDRELS—Set of 14 does work of 209 solid arbors; sensational time savers in some operations. Sold singly or in sets; for bores ½" to 7". Bulletin 1043.



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line, every knack from a knock, missing digits, creased forehead, wrinkled pants, ingrained stain and dirt all hash marks of well-rounded service—Junior picked some up for free-from-home association, was guided firmly around this or that and sent to a "school" where in all honesty, one must admit, it is possible to pick up in months what can otherwise take years to acquire. So it went in several cases—son followed father, but not into this outfit.

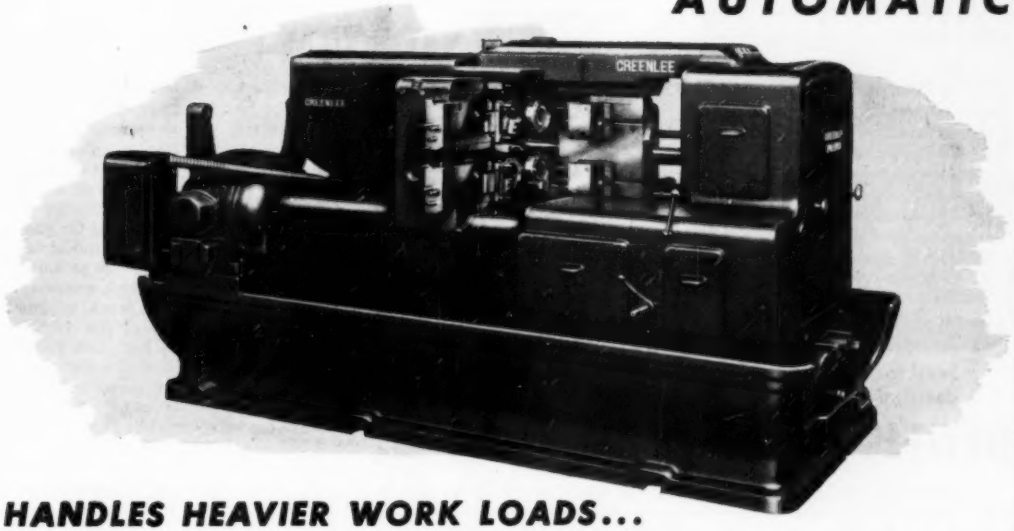
The general superintendent's son (the company was now that large and growing still) graduated with honors as an engineer. The "old firm" needed engineers and was hiring them, one can even say sentimentally perhaps, needed better ones than it was getting—more of the caliber of our "hero"—but the rule held, stuck and never swerved. You've probably guessed the rest—so we'll shorten it. Sad but true, the boy went to work for one of the strongest competitors and today as that company's general manager is rather a too-constant reminder of a policy that does seem to have been a bit shortsighted.

There is, as we all know, the other extreme where the whole family enters in at all and any angle. In the instances where the "old man" has been a bit prolific of sons, with a daughter or so, the picture of the organization chart for the third generation, when each of say 4 or 5 sons now incumbent makes a contribution of only two of his (to say nothing of a son-in-law or so), is too cosy for any other young'un not of the blood "royal." The additional goad of seeing one of the fair-haired make his way from one position to another isn't likely to supply an inspirational spark to non-related contemporaries.

Wording it that way does give a picture of biased unfairness, but two things should be borne in mind. First, the firm is a family concern and every man would react the same, except for our just-quoted exception who long since must have felt the error of its ways. Secondly, any person entering such an organization must expect and be prepared for what he is going to see: actual or implied favoritism, clannishness, etc.

As to the family ganging up farther down-the-line and making things miserable for their bosses, this has so many facets one would really need to quote specific instances in a long debate then add the whole, for a firm decision, were it not for one thing—an inherent belief that basically people are fair-minded and the majority will listen to their own and

RE-DESIGNED GREENLEE 4-SPINDLE AUTOMATIC



HANDLES HEAVIER WORK LOADS...

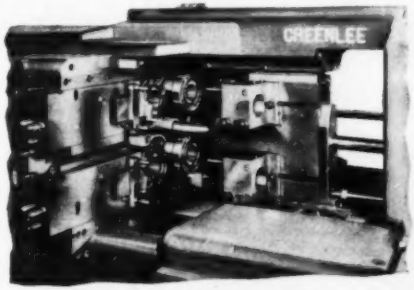
RIGIDITY AND APPEARANCE ARE IMPROVED

Several important structural changes have been made on the Greenlee 2-5/8" 4-spindle Automatic which increase its capacity to handle the heavier cuts demanded by ever-changing production methods.

An overarm has been added that rigidly ties the spindle carrier to the gear box, giving full support when heavy end-working tools are used. Increased lateral thrusts have been offset by tying the main tool slide to the overarm with gibbed ways.

These changes have not detracted from the accessibility of the work area. It is still wide open for set-ups and adjustments.

The Greenlee "4" embodies all the features of the popular 6-spindle machine . . . the convenient, built-in overarm lighting, identical tool cavities and tool holders, rapidly interchangeable cross-slide cams, quick adjustment of the main tool slide stroke, built-in coolant system, quick-change feed and speed gears, and many other advantages for maximum set-up and operating efficiency.



VERSATILE, ACCURATE TOOL SLIDE

Full support of the main tool slide on the improved Greenlee 4-spindle Automatic has been achieved by using gibbed ways built into the overarm. Increased rigidity and greater precision, even under the most rigorous cutting loads, are definitely assured through this additional bearing surface. The large, roomy tool slide has ample space for mounting tools one behind the other at each spindle position. Grouping of tools in this manner allows operations on long pieces to be split up, with a substantial reduction in the machining time ordinarily required for this work. The range of operations possible on the machine is also extended by this versatility.

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.040" in 25 to 30 Minutes

SOLVES PROBLEM OF SELECTIVE HARDENING
by applying only to desired sections

NO SPECIAL FURNACES OR EQUIPMENT NEEDED
—even an open fire will suffice

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—repair units can be hardened right in maintenance shop. No special training required

CARBURIT IS NON-TOXIC

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ISOLATING PASTE

KEEPS DESIRED SECTIONS SOFT

While rest of workpiece is being hardened

REPLACES COPPER PLATING—
and other expensive methods.

JUST PUT ON AND KNOCK OFF
Saves time, money.

PREVENTS PENETRATION OF CARBON AND SLOWS DOWN COOLING OF COVERED SECTION.

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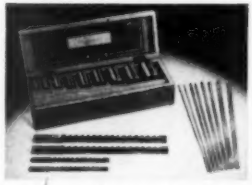

what they do for you, what they cost, how much time and money they save you cutting keyways in gears, milling cutters, pulley hubs, collars, couplings, etc., etc.

This Kit may be worth a lot of money in your shop. It only costs a postage stamp to find out!

THE du MONT CORPORATION
Greenfield, Massachusetts

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Name and Position.....

others' reasoning if well presented.

If supervision stinks, at least the personnel relations part of it (which may be the whole) as it often does, you don't have to be somebody's brother, aunt, or sister Sue to get "browned off" singly or collectively. In such an instance, the action of a "family" pressure bloc helps rather than hinders in the end.

Looking at a purely selfish-management angle—you hardly expect a wild-cat strike or any other work-stoppage flair-up to get inconsidered backing from a family where all the income for the household comes from one plant. "Bad enough all the money stops, but you should all hang around the house underfoot all day!" Yes sir, family as an organization is a wonderful thing—working for you, but to me the greatest industrial shame, when it could mean so much the other way, is to hear a workman say—"What, my boy, work in this c%%t&! hole—brother, this is the last place—the *very* last place you'll ever see any kid of mine work! Just let me catch him even thinking about getting a job here! He won't make the same mistake Al and I did —No, sir!"

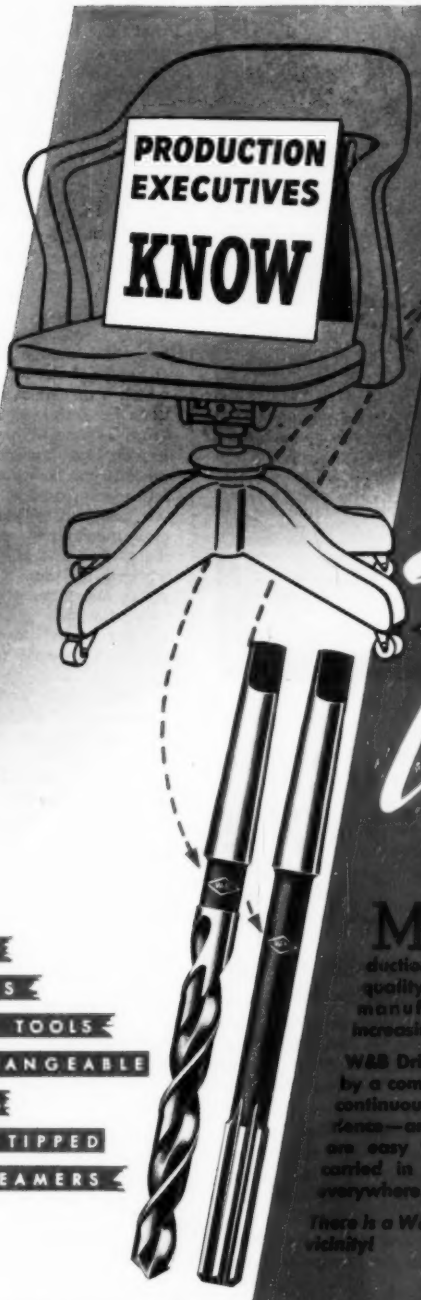
A. M. Elliott
LeRoy, N.Y.

•

Several years back I hinted, to a brother-in-law of mine, that I wouldn't mind working at the plant where he was superintendent of one of the large rolling mills. He lost no time in cautioning me not to let it be known that I was related to him, as it was against the policy of the company to hire a person who was related to another already employed.

That may have been the case—I never doubt the word of a relative! However, if such was the policy of the company, I cannot see where they would gain by such restrictions. Are men likely to be any more troublesome as brothers in the flesh than they would be were they 'brothers' in the same church, or fraternal organizaton? Have members of the same family been known to stick together more than members of a union? I cannot see why relatives are likely to cause any more trouble than men who drink the same brand of beer.

Not so long ago, I happened to mention to my superior that a son-in-law of mine was looking for a job, and I was informed that he couldn't get on the staff because they had adopted a non-relative policy. I asked why such a policy was put into effect and was told that ever



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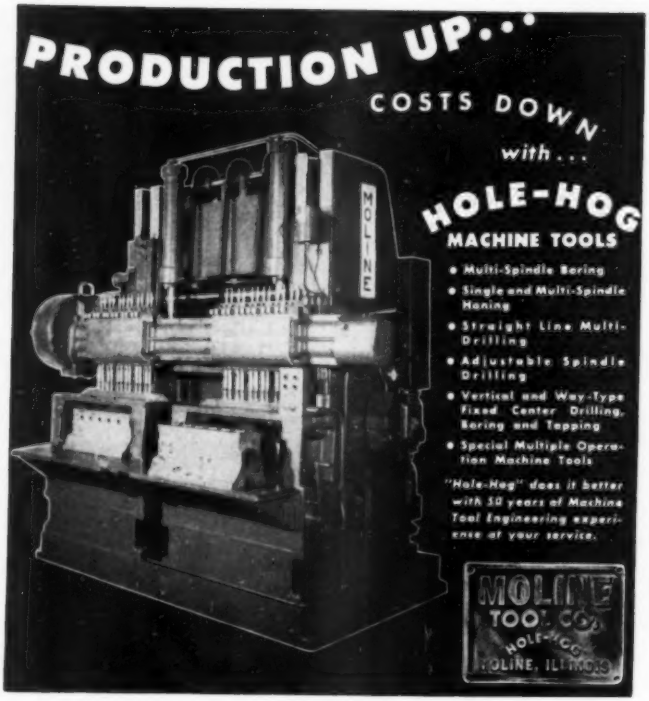

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since one man was put on they found that their hands were tied—he being the son-in-law of another. The 'son' proved unsatisfactory and they felt that they would have offended the old gent if they had let him go at the end of the term. Instead of tying a can to the unsatisfactory one's tail, they weathered through the unsatisfactory period and adopted the 'Maginot Line' policy to prevent any repetition.

There are instances where relatives are inclined to gang up on a boss to make things hot for him, but ordinarily members of the same family do not cause any more trouble than though they were total strangers. I can recall an instance in which a machinist landed a job and upon his arrival home that night he informed one of his sons, who was looking for a berth, what a fine place it was to work. Naturally the fellow expressed a desire to get on but was told by his father that the boss was touchy about having any more than one of the same family working for him. This deterred the young man none, for he applied the next day and was put on—using another name! The family resemblance was most evident and the boss soon caught on, but inasmuch as they both proved to be a good investment he laughed the matter off and from then on didn't hesitate in hiring relatives.

As I look back, I can recall four instances wherein relatives were employed in various shops and there was no sign of obstructiveness of any kind. They all managed to turn out a good day's work and managed to mind their own busness. If anything, they were inclined to help each other out—eventuating in the employer's benefit.

My father, brother, and I were employed in the same toolroom many years back and only recently I came upon our old boss. During the course of our conversation he volunteered: "I often wished that I had more families working for me like yours, Jack," he went on to say. "You fellows seemed to get along well together and turned out more than your share of work." I didn't tell him that my brother and I were constantly prodding the old man to get going. Dad liked to stall. This is one concrete evidence of the value of relatives who were ganging up—not on the boss but for the interest of the firm for whom they worked.

Another instance in favor of relatives in the same department is recalled. John was my millwright during the old war days of '17 and asked for a job for his younger

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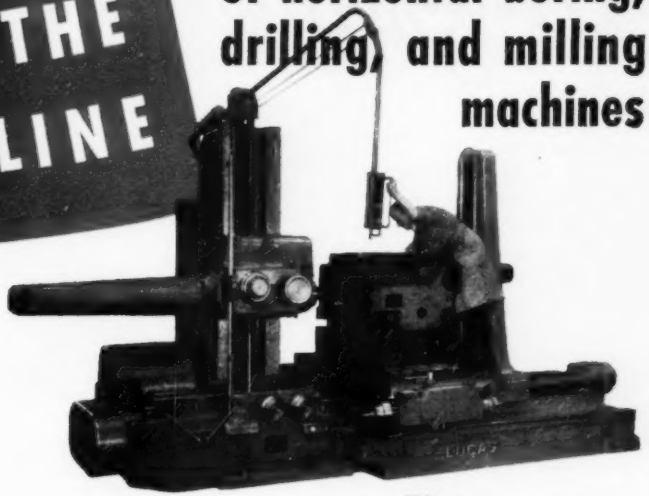
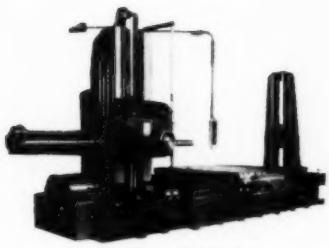
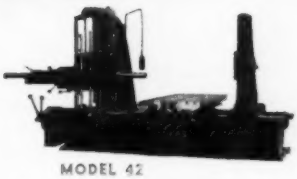


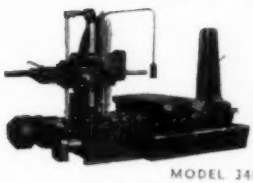
MODEL 460



MODEL 548



MODEL 42



MODEL 348

Well described as "one man machine shops", these versatile machines combine precision with ruggedness that makes them equally valuable for tool room work and as production machines.

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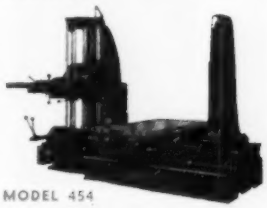
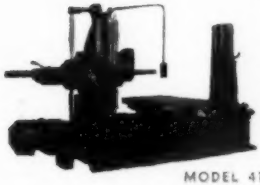
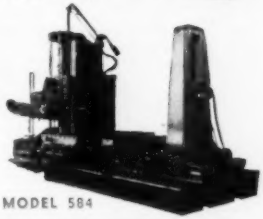


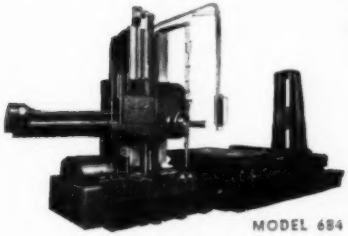
MODEL 454



MODEL 41



MODEL 584



MODEL 684

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brother. Relative or no, it made no difference to me as long as the work was done. "John," I said to big brother, "I'll start Frank in as your helper." "I don't want any helper," he replied. "Put him somewhere where he can do his own work." "Won't you need some help in getting that countershaft up for the Warner & Swasey?" I asked. "No, I'll get it up myself," he quickly replied and was off about his work.

So you see, relatives in a shop are not a hindrance. From my observations they co-operate with each other to their own interests; they gang up to bolster a dragging member; and they insist upon their brothers being given work wherein the amount of the work produced is evident.

John Homewood
Ontario, Calif.

•

Two or more relatives in the same shop have been known to connive together and make trouble.

When one person has a trouble-making disposition, a relative may be used as a partner in whatever scheme is to be brought to the front, however where there is no relative available, and an accomplice could be found of no relationship, this one in all probability would be selected and served for the unfriendly act just as faithfully and thoroughly.

It is not just to judge a person because of his relatives. Those who are square dealers should not be judged by their ancestry or any of their relatives. Each individual should be selected on his own merits.

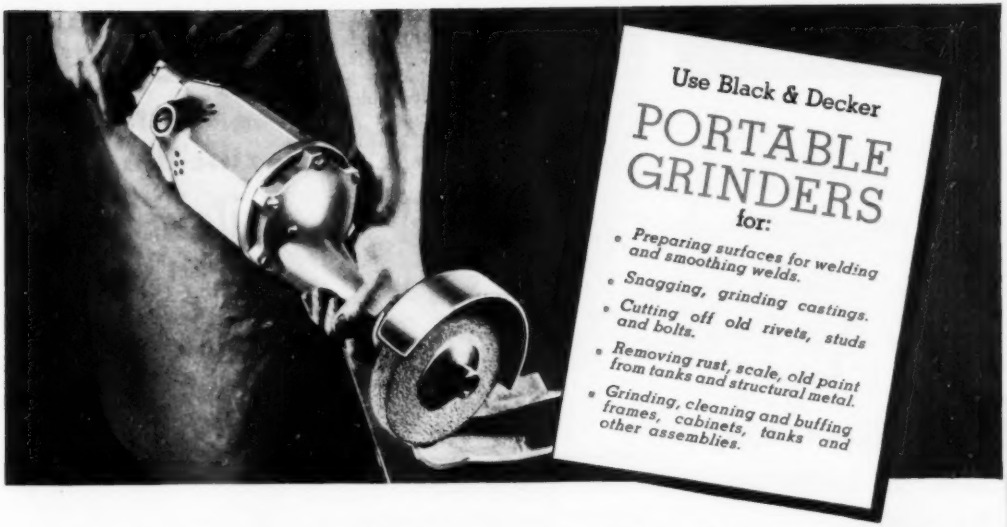
It is only the natural thing for a man having a satisfactory job to be getting his friends interested in the same place, very likely giving his relatives first chance.

Abel Blakeman
Watervliet, N. Y.

•

It has been my experience that relatives do not stick together or form a clique any more so than the average workers who are not related. If there were two relatives working in the same department and both knew all there was to know about the job they are doing and who have good or outstanding qualities I would not hesitate to hire the third.

In a case like this I would consider the attitude of these two relatives toward the firm, its executives and its foremen. If both men obeyed the rules, if they liked the firm they were working for, if they were not the type who complained, then I would say it would be a safe bet to hire the third relative. If, however,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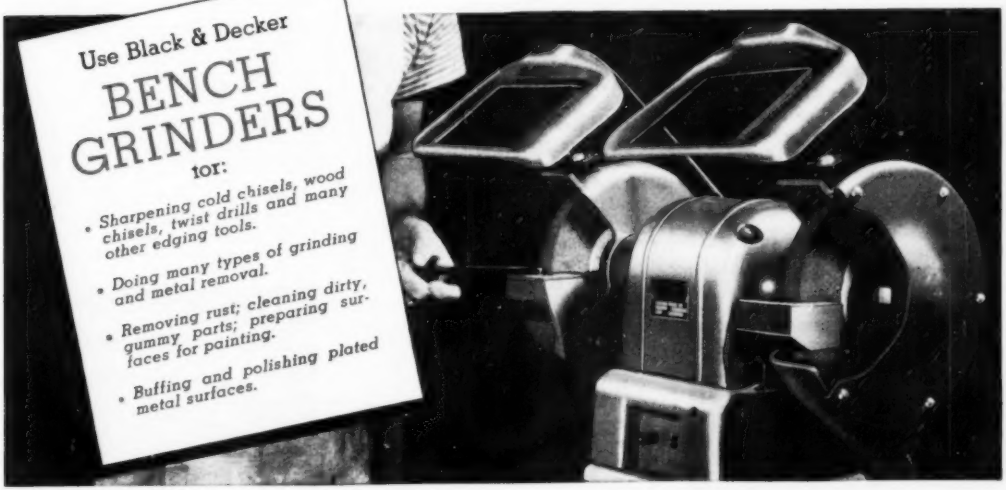
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one or both of these relatives were the type who wanted something for nothing, or who were below par in quality, quantity, reliability, initiative or punctuality, I would be afraid to take the chance.

In many cases relatives do not think alike and do not hold the same point of view, in fact in some instances father and son hold widely separate views.

I would suggest to Ed that he take a blank piece of paper, draw a line down through the middle, mark advantages on one side and disadvantages in the opposite. Fill out both columns and check score for answer.

A. E. Salmons
Philadelphia, Pa.

NEW BOOKS

TOLERANZEN UND LEHREN—*By Dr.-Ing. Paul Leinweber. Published by Springer-Verlag, Jebenstrasse 1, Berlin—Charlottenberg 2, Germany. Price 8.40 marks.*

This book, in German, is intended primarily for the machine designer. Individual chapters deal with the various classes of fits, and acquaint the reader with accepted theories and rules by which tolerances should be determined. The many types of gages, their proper use in shops, assembly rooms, and the methods of their construction are clearly presented. A score of examples follow the theoretical discussion of gages of every variety. Over a hundred line drawings and charts of a good quality are an effective aid toward the presentation of details and values.

The author proceeds by easy stages throughout. Theoretical matter and practical problems are held to the level of the average engineer. This, and the fact that there is no attempt to bring up problems which may require gages of individual design, lets one hope that the book will find wide circulation among technicians, and will inspire them to develop gages for special purposes, which in turn may allow the building of precision machinery at a saving in cost.

In an appendix the author analyzes a handful of cases both from the theoretical and practical viewpoint. He deliberately chooses simple, everyday cases. How and why and what tolerances and gages will best answer each problem are discussed.

The book is written clearly and concisely. When one disagrees occasionally with the author, it is with

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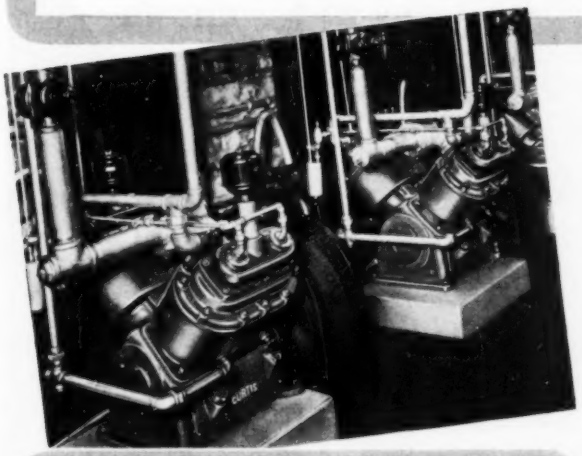

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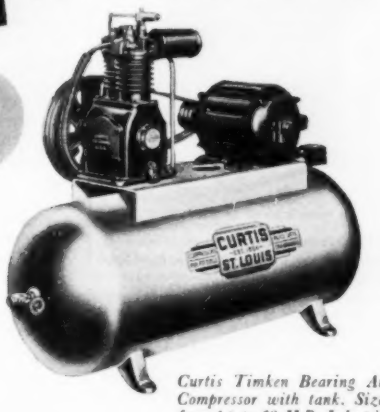

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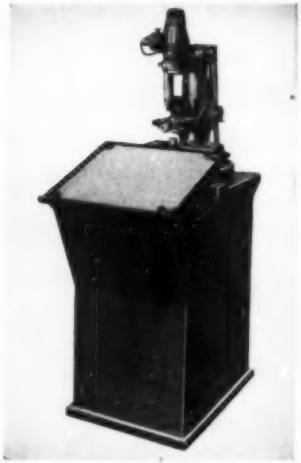

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respect to a borderline question as to what is practical; again, such diverging views may be traced to differing industrial methods.

The author's belief that angles should be toleranced just as often as are lengths, widths and depths, deserves thoughtful consideration. It would be difficult to challenge his opinion, that over-zealous designers of industrial machinery are likely to tolerance an unreasonable number of measurements on the blueprints, a practice that leads to confusion in the shop. His warning to designers of machines, or parts of machines, that snug fits and highly polished surfaces must not be demanded where a free fit and less smooth surface would do, merits careful attention.

•

PATENT LAW, 2ND EDITION—*By Chester H. Biesterfeld. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price $4.*

Written for engineers, inventors, researchers, chemists, and patent attorneys, this book presents the basic principles of substantive patent law in terms the general reader can understand. Not encyclopedic, it affords a ready entrance to the various subjects with accompanying quotations of the authorities. This extensive revision of an earlier text was prompted by changes in the patent laws during the past five years and by a considerable number of important court decisions. Now the various subjects are brought up to date.

•

AN OUTLINE OF ADVERTISING FOR ENGINEERS—*By J. W. B. Tunstall. One of the Mechanical World Monographs (252) 36 pages, 5 x 7½ in. Paper covers. Published by Emmott & Co., Limited, 31 King St., West, Manchester, England. Price two shillings.*

This is an outline, but provides many basic facts about advertising for the small-company engineer or owner who undertakes the handling of his own advertising, both publication and direct mail. It points the way between featureless stodgy "announcements" and superficially "smart" ads of the general-publication type to the sound informational approach that wins and holds readers in technical magazines. While the phraseology and reasoning are essentially British, the ideas are still sound and usable by Americans as well.

Which blade?
How many teeth per inch?
How many strokes per minute?

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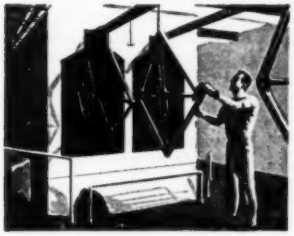
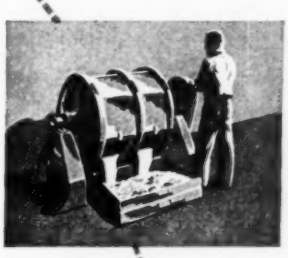
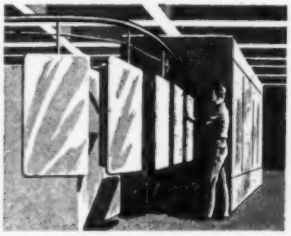
ELECTROCLEANING? Oakite Composition No. 90 removes oils, smuts, films that interfere with good electrocleaning on steel. Has high conductivity, good wetting action. Bubbles keep alkaline spray from being nuisance, yet prevent explosive foam.



PRECLEANING? In spray-washing machines, Oakite Composition No. 97, emulsifiable solvent cleaner with water, removes buffing and other compounds from steel, cast iron, brass, aluminum, zinc. Gives temporary rust prevention. Use before electrocleaning, plating.



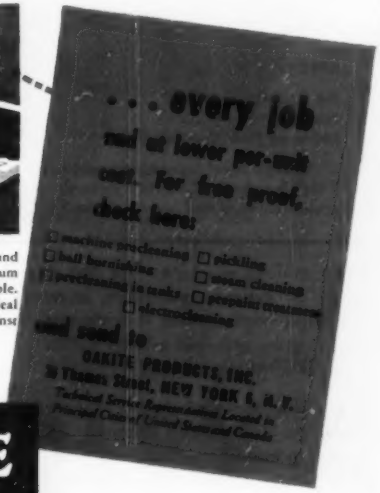
BALL BURNISHING? Oakite Composition No. 3 lubricates, "suds up" even in hard water. Free of metal-harming ingredients. Suspends dirt, keeps it from smudging work. Brings out brilliant luster on metal. Also good to clean shots, shapes.



PRE-PAINT TREATMENT? Oakite CrysCoat Process conditions iron, steel, zinc, copper alloys 3 ways: removes light oils, spinning compounds; develops phosphate film that *holds* finishes; inhibits rust before and after finish. Low cost per sq. ft.

STEAM CLEANING? Oakite Composition No. 92 removes grease and dirts quickly. No toxic vapors. Detergency combines with steam pressure to clean fast. Good on big parts. All you need is hose, gun, solution container, 40 lbs. steam pressure.

PRECLEANING IN TANK? Oakite Compound No. 36, acidic cleaner conditions aluminum for paint. Makes surfaces inert as possible. Provides microscopic phosphate film ideal for tenacious finish adhesion. Guards against scratched-finish corrosion.



OAKITE 1909 1949 40 ANNIVERSARY YEAR

OAKITE

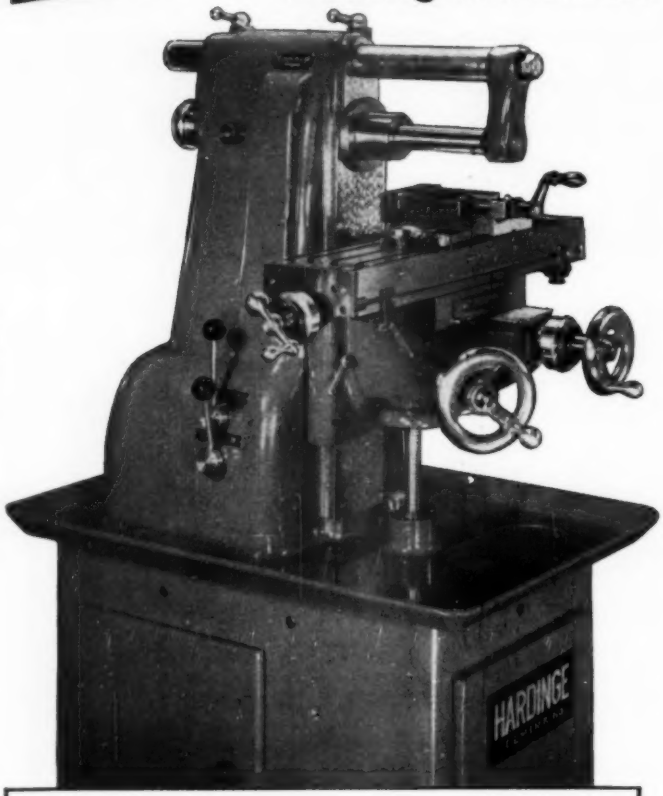
REG. U.S. PAT. OFF.

Specialized Industrial Cleaning

MATERIALS • METHODS • SERVICE

HARDINGE
ELMIRA, N.Y.

High Speed Precision Milling Machines



SPECIFICATIONS:

TM Model	UM Model
Non-Swiveling Table	Swiveling Table
Universal Plain Dividing Head	Universal Spiral Dividing Head

1" through collet capacity for both cutter and dividing head spindles; 11½" longitudinal, 13¼" vertical, 5½" transverse travel; eight speeds forward and reverse. Write for Bulletin TM-UM.

Large milling machines are too expensive and slow for the entire range of milling operations in tool rooms and laboratories. The Hardinge High Speed Precision Milling Machine should be considered first for efficient milling within its capacity — leaving the larger work to larger machines.

Analysis of investment and time costs will prove the wisdom of using Hardinge High Speed Precision TM or UM Milling Machines . . . designed to meet your exacting requirements for precision, ruggedness, ease of operation, and a definite range of work.

HARDINGE BROTHERS, INC., Elmira, N. Y.

Offices in Principal Cities. Export Office 269 Lafayette St., New York 12, N. Y.

HARDINGE
BROTHERS, INC.

Sales Offices and Representatives

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544 W. Washington.
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Garco Machinery Company
7702 Carnegie Avenue.
Phone: ENdicott 7811

Dayton 2, Ohio
4 South Main St.
Phone: HEmlock 9880

Detroit 1, Michigan
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Phone: TEmple 1-5413

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Eccles-Germain Machinery Co.
1910 Santa Fe Ave.
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Minneapolis 1, Minnesota
201 Washington, North.
Phone: MAin 0934

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269 Lafayette St.
Phone: WAlker 5-9677

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Phone: Lucas 1223

West Hartford 7, Connecticut
7 South Main St.
Phone: 3-4291

Representatives in other cities, upon request.

NEW

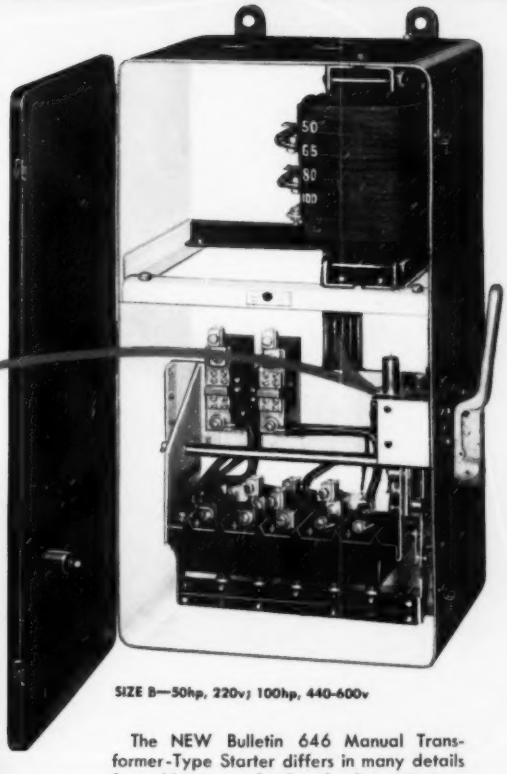
Bulletin 646

Manual Transformer-Type Reduced-Voltage Starter

Here is the first outstanding improvement in manual transformer-type starters in twenty-five years. It is a worthy addition to the Allen-Bradley line of motor controls.

An unusual feature is its adjustable time delay, which prevents careless operators from switching the motor too quickly to full running voltage. Many other features are described on the next page.

with time delay switchover



SIZE B—50hp, 220v; 100hp, 440-600v

The NEW Bulletin 646 Manual Transformer-Type Starter differs in many details from older types of reduced-voltage starters.

Time-tested developments . . . like Allen-Bradley double break, silver alloy contacts . . . assure long, trouble-free service. See next page for further details.

Allen-Bradley Co., 1316 S. Second Street, Milwaukee 4, Wis.

ALLEN-BRADLEY

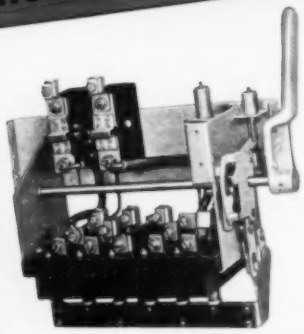
BULLETIN 646 TRANSFORMER-TYPE STARTER

QUALITY

TURN
see next page

EXCEPTIONAL FEATURES *of the*

Bulletin 646 Manual Transformer-Type Starter



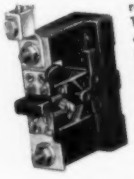
TIME DELAY SWITCHOVER

The Bulletin 646 switching mechanism is a simple, mechanical linkage operated by a two-position, manual starting lever. When the lever is pulled forward, the switch mechanism moves the contacts into the "Start" position. This permits the motor to accelerate at reduced voltage.

An interlock, under dashpot control, prevents the starting lever from being thrown into the "Run" position until the motor has accelerated for several seconds. This timing is adjustable to suit varied starting conditions.

No-voltage protection is also provided by a magnetically operated hold-in latch. Man, motor, and machine are fully protected against accidents and damage from line failures.

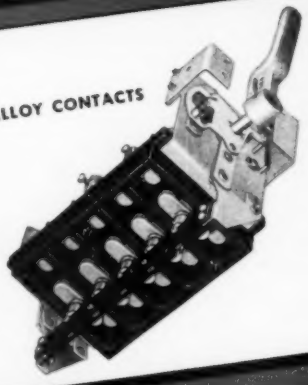
DEPENDABLE OVERLOAD RELAYS



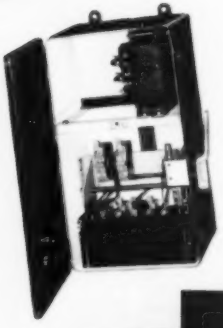
The accurate, reliable overload relays operate on the soldered ratchet principle. They remain reliable in operation, even after long inactivity. Thermal elements available for any load. Contacts are pure silver.

DOUBLE BREAK, SILVER ALLOY CONTACTS

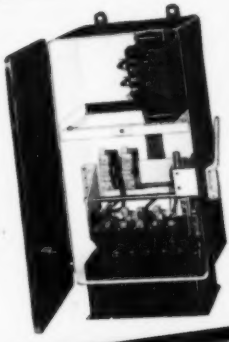
Starting and running contacts are mounted in a molded contact block. Double break, movable contacts are attached to copper spanners, spring-mounted on an insulated rocker arm. In the starting position, the movable contacts bridge the motor and reduced voltage contacts. In the running position, they bridge the motor and line voltage contacts. Easily accessible for inspection.



CAN BE SUPPLIED WITH OIL-IMMERSED CONTACTS



For installations requiring oil-immersed contacts, Bulletin 646 Transformer-Type Starters can be supplied with an oil tank, inserted through the bottom of the enclosure. The tank is suspended on threaded studs, which serve as hangers when the tank is lowered. Since contacts immersed in oil deteriorate much more rapidly than when operated in air, air-break starters are preferable for most applications.



Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wis.

TURN
see front page

Send for Bulletin 646

ALLEN-BRADLEY

Reduced-Voltage Starters for Squirrel-Cage Motors

QUALITY

Your Source of Supply for Better Taps

There are many sources of supply for standard taps . . . also varied degrees of quality in manufacture. The only way to determine *your* best source is by (1) reputation of the manufacturer in the trade, (2) your on-the-job performance of the taps you buy on the basis of tapping cost per hole.

However, if you run into troubles, it is far better practice to consult *your* manufacturer, stating the trouble in detail and requesting a solution. Hanson-Whitney engineers welcome such inquiries . . . in fact, we request them. We stand firmly back of Hanson "Finished Taps" of both Standard and Special make.

And as for "Specials," you'll find no *better* source of supply anywhere.

Measurement of Tapping Costs

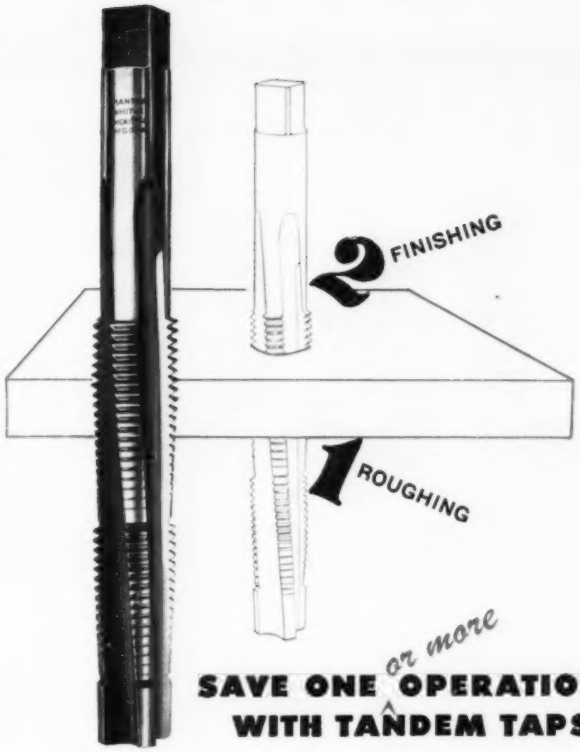
Economy of tapping is measured only by the cost per tapped hole . . . not by the cost of the taps themselves.

In high speed tapping the Hanson-Whitney "Finished Taps" clearly demonstrate their superior value both for accuracy and economy. The accuracy with which they are made results in long tap life, minimum breakage, and perfect threads. It naturally follows that they are the most economical to use.

Explain Your Job in Detail . . . We'll Serve You Better

When ordering, specify grade of material to be tapped, depth of tapped hole, class of fit and whether through hole or bottoming. With full information we can give you correct hook or rake on cutting faces, number and style of flutes and proper chamfer. Thus you obtain the right tap for the specific operation . . . lower costs, quality threads.

2NW49



SAVE ONE *or more* OPERATIONS WITH TANDEM TAPS

A Hanson-Whitney "Tandem Tap" embraces two distinct sections . . . the lower one for roughing, the upper for finishing . . . both sections being uniform in lead, providing added chip space, better lubrication to the roughing section.

This type is recommended only where conditions permit both sections to pass through the work . . . and preferably where the tap can be removed, without reversing.

If you have difficult tapping problems, steep leads, long threads . . . and if superior finish is essential, the results cannot be excelled. Moreover, this "Tandem Tap" will produce in *one* operation what generally requires *several* taps . . . a decided cost saving in production tapping. Available in any form of thread or limits.

HANSON-WHITNEY MACHINE CO. HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

For practical recommendations submit your problems to Hanson-Whitney engineers.

Hanson Whitney

PIONEERS OF FINISHED TAPS

(advertisement)

Another outstanding J&L development—

J&L "E"

FREE-CUTTING STEEL

A new bessemer

SCREW STOCK

with proved machinability ratings as high as 170!

- Backed by 50 years of leadership in the field of free-machining, cold-finished steels.
- Proved by exhaustive field testing.
- J & L "E" Free-Cutting Steel is made in *three* grades: E-15, E-23 and E-33, each within the composition limits of the standard bessemer screw steels and with similar tensile properties.

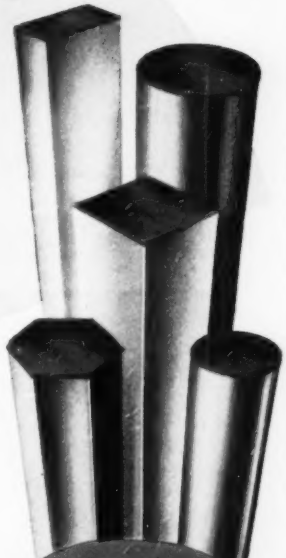
Note the following equivalents:

E-15 - equivalent standard grade, B-1111
E-23 - equivalent standard grade, B-1112
E-33 - equivalent standard grade, B-1113

J&L STEEL

Forty-five independent machine shops, throughout the metal-working industry, have tested over *6,100 tons* of J & L "E" Steel in more than 100 applications. These shops report:

- **BETTER MACHINE FINISH**
- **LONGER TOOL LIFE**
- **HIGHER SPEEDS**
- **MACHINABILITY RATINGS UP TO 170**
- **BETTER RESPONSE TO FORMING AND COLD WORK**
- **HIGHER MAGNETIC PERMEABILITY**



All standard sizes and shapes are available.

For 50 years J&L has led in the development of free-cutting, cold-finished steels—both bessemer and open-hearth. Every new J&L steel introduced in this field has been a major contribution toward the lowering of the unit cost of machined steel parts. Now we offer you J&L "E", a bessemer grade steel with distinctly greater free-cutting efficiency.

During the development of J&L "E" Steel, at least four years were spent proving its qualities, in the field, under a great variety of machining conditions. In the course of our investigations, J&L metallurgists have accumulated considerable data and a large number of case histories. Therefore, we say with assurance that J&L "E" free-cutting steel opens the door to new production economies you never thought possible.

You will want complete information on this latest J&L steel development. Let us discuss the money-saving possibilities of J&L "E" Steel with you. The coupon is for your convenience.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 19, Pa.

I should like to have more information on J&L "E" Free-Cutting Bessemer Screw Stock. Please have your representative call.

Name _____

Title _____

Company _____

Address _____

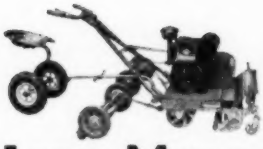
_____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY *(hi-tensile steels).*

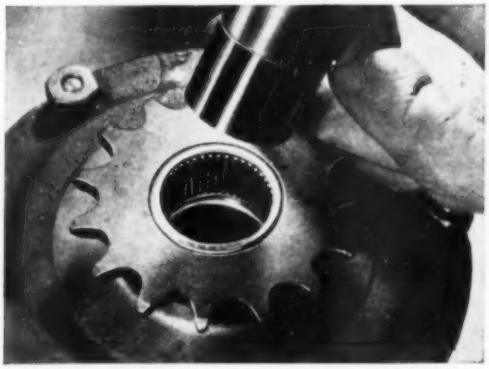
PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

Torrington Needle Bearings Reduce Friction, Simplify Design for Coldwell-Philadelphia Lawn Mowers



Power requirements are reduced by the smooth anti-friction operation of Torrington Needle Bearings in mowers built by Coldwell-Philadelphia Lawn Mower Company. Needle Bearings also provide high radial capacity to take the shock of rough service.

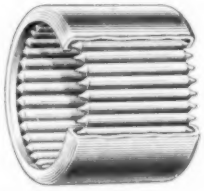
Quick, easy installation of Needle Bearings in mower wheels cuts assembly costs. Only a plain machined bore is required for a housing. No snap rings, shoulders or other retaining devices are needed. These Needle Bearing features mean simplicity and economy.



Lubricant is retained over long periods of service by the close-fitting, turned-in lips of Needle Bearings. In the gang unit cutter clutch gear, above, this construction also helps exclude moisture and dirt. Long service life is secured with minimum maintenance.

A space-saver indeed! A large main clutch shaft is supported in a relatively small housing, thanks to the compactness of Needle Bearings. This construction, plus the tremendous load capacity of these anti-friction units, means a lighter, sturdier mower.

You can gain the benefits of anti-friction operation in a space-saving and weight-saving design with Torrington Needle Bearings. Our engineers will be glad to help you adapt these high-capacity units to your requirements. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and distributors in principal cities.



TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller • Straight Roller • Ball • Needle Rollers

Dayton V-Belts
DRIVE-PROVED
TO CUT
Maintenance Costs
Dayton V-Belts have driven this huge asphalt mixing machine for 16 years, without a single V-Belt failure!

...and they are as near as your phone!

Eliminate ruined bearings, burned out motors and drive failures. Add years to equipment life—reduce maintenance with Dayton V-Belts. For Dayton V-Belts are *Drive Proved* to save you money.

In thousands of plants, under every conceivable operating condition, they have proved their ability ... to transmit full power with little or no loss ... prevent motor overloads because they won't slip or stall ... cushion bearings by absorbing shock loads. And they wear and wear, despite abrasive conditions, moisture, heat or cold.

There is a Dayton Distributor near you, ready to equip your plant with Dayton Drive Proved V-Belts and Pulleys. He has the specialized knowledge to recommend the right drive for your plant. If it's an unusual application, he has the resources of the entire Dayton organization to call on.

You'll find him listed in the classified section of your telephone directory under "Dayton V-Belts", or his representative is calling at your plant now.

Get in touch with him. See how Dayton Drive Proved V-Belts can save you money, in maintenance, long life, more efficient drives. *The Dayton Rubber Company, Dayton 1, Ohio.*

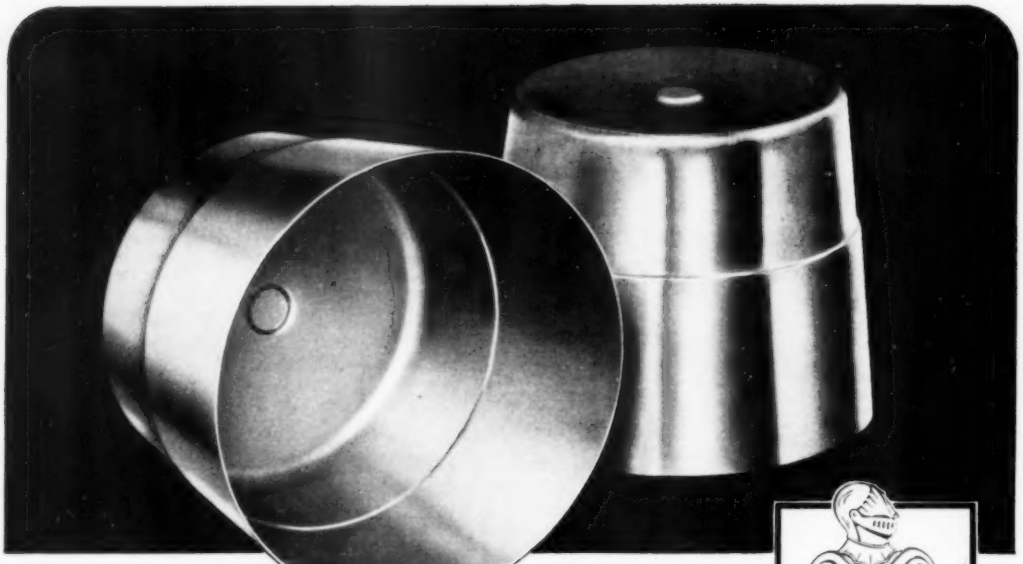
ONLY Dayton V-Belts are DRIVE PROVED for the Job!

Dayton Thorobred—for normal and heavy duty drives.
Dayton FHP—for small machines and appliances.
Dayton Cog—for shortest centers, smallest pulleys.
Dayton Steel Cable—for extreme loads and speeds.

ALL STOCKED BY YOUR LOCAL DAYTON V-BELT DISTRIBUTOR

Dayton Rubber

THE MARK OF TECHNICAL EXCELLENCE IN NATURAL AND SYNTHETIC RUBBER



Ingenuity...

This appears to be a simple stamping. However, the combination of the tapered shape and the light gauge material makes it difficult to draw without wrinkles. Once introduced, it is almost impossible to eliminate a wrinkle.

Carefully planned tooling — the correct number of preliminary operations, plus an ingenious reverse draw — solved this difficult stamping problem.

Result... uniform parts with a minimum of die marks, permitting economical preparation of the surface for high lustre plating and polishing.

WORCESTER PRESTEEL

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ALLOY STEELS AND OTHER METALS COLD FASHIONED SINCE 1883

PRECISION METAL STAMPINGS FOR EVERY TYPE OF INDUSTRY

WORCESTER PRESSED STEEL CO.

805 BARBER AVENUE
WORCESTER 6, MASS.

Capable hands directed by intelligent thinking are a key to manufacturing ability. The skillful, sensitive hands of an inspector are typical of those that guarantee the precision and quality of a product. Equally important are the hands that design . . . that operate the machines . . . that perform the laboring and clerical tasks. And directing all operations must be management that is "in capable hands." An organization with capable hands at work in *every* department can make honest claim to "Precision, Experience, Dependability."

PRECISION • EXPERIENCE • DEPENDABILITY

ALLIED CORPORATION PRODUCTS

ALLIED PRODUCTS CORPORATION
DEPARTMENT 45
4612 LAWTON AVENUE • DETROIT 8, MICHIGAN

HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS
SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC
MOLDS • SPECIAL PRODUCTION TOOLS • R-B INTERCHANGEABLE PUNCHES AND DIES • DIE MAKERS' SUPPLIES

You have been elected

IT is time to recognize anew the obligations of leadership--the reponsibility that attends your place in the business life of the community.

That there are influences at work right now--every day--attempting to disrupt and destroy the American way of life--has been plainly demonstrated. These forces, disguised though they be, are more active - more determined - more dangerous than ever before.

To save individual liberty and personal freedom--corner-stones of our civilization--may not be easy. As a leader you are called upon continuously to help form and direct a militant public opinion. Only by the united, vigilant efforts of all citizens of good will, those who cherish our principles of government and our ideals, will we maintain our invaluable heritage of liberty, justice and freedom.

The Youngstown Sheet and Tube Company

General Offices -- Youngstown 1, Ohio

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MANUFACTURERS OF CARBON, ALLOY AND YOLOY STEELS

ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

SELECTED DISTRIBUTION

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Double Circle Tools

FOR MORE HOLES PER GRIND

CALL YOUR LOCAL DISTRIBUTOR

CHICAGO LATROBE

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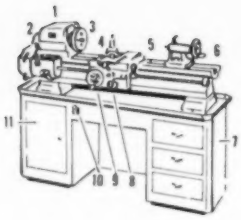
CHICAGO 10, ILLINOIS

NEW YORK PHILADELPHIA LOS ANGELES



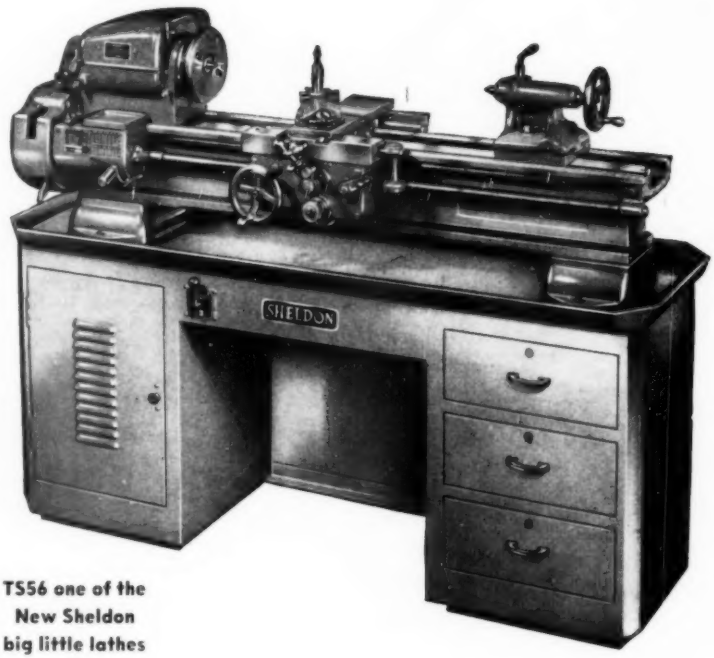
1. Zero Precision Taper Roller Bearings — most accurate made.
2. 1⅜" hole thru spindle — 1" collet capacity.
3. 11¼" Swing.
4. Spindle run out accuracy within .0005.
5. Heavier carriage, wider bearing on bed.
6. 56" Bed held within .0005" of parallel alignment.
7. Reinforced steel cabinet bench with plate top.
8. Large double wall apron.
9. Standard big lathe controls.
10. Front Switch.
11. 8-speed, v-belt, enclosed underneath motor drive.

The more you compare

Unless you have kept up-to-the-minute on the post-war developments in the new lighter, less expensive lathe field, you will be surprised at the tremendous advance in accuracy, capacity, speed, stamina and earning power that have been made in this field.

You will also find, that the more you compare these new lathes, the more you will determine on

SHELDON



TS56 one of the New Sheldon big little lathes

WRITE FOR NEW G-48 CATALOG

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U. S. A.

WAREHOUSE STOCK

Why they think of WARD when it's SPRING STEEL

- **BLUE TEMPERED SPRING STEEL**

  Many Hundreds of Sizes

  .002" to .065" in thickness — .95 to 1.05 Carbon — 48-51 Rockwell

- **COLD ROLLED ANNEALED SPRING STEEL**

  .003" to .183" in thickness — .70 to .80 Carbon — .90 to 1.05 Carbon

CLOSE TO A THOUSAND SIZES IN STOCK — AND COMPLETE SLITTING AND SHEARING EQUIPMENT ENABLE US TO FILL PROMPTLY THE MAJORITY OF ORDERS RECEIVED

•

WAREHOUSE SHIPMENTS ONLY ON THE ABOVE SPRING STEELS. NO EXPORT ORDERS.

SPECIAL ANNOUNCEMENT

Our new CHICAGO WAREHOUSE—3042-3058 West 51st St., Chicago, Illinois—Tel. GRovehill 6-2600—is now open for business with a complete stock of BLUE TEMPERED SPRING STEEL and SLITTING FACILITIES. This new warehouse will enable us to serve more efficiently our customers in ILLINOIS, INDIANA and WISCONSIN and in ALL AREAS WEST of the MISSISSIPPI RIVER.

WARD STEEL CO.

TELEPHONES
Liberty 2-2770, Boston 10, Mass.
GASpee 8573, Providence, R. I.

42 FARNSWORTH ST. BOSTON 10, MASS.

Unfrightened by dire predictions, leaders of American business always have planned with confidence in the future . . . and, in the long run, their faith has paid off. Such courageous leadership helps to *create* good business.

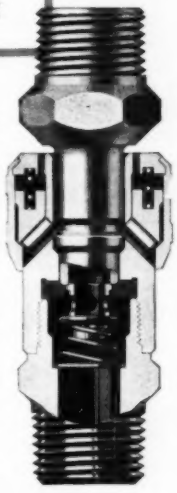
Good business means jobs for those who want to work. It's the best defense against the termites who are working to undermine the individual liberties Americans enjoy. 6593

SKF INDUSTRIES, INC. PHILADELPHIA
BALL and ROLLER BEARINGS

WITH HANSEN COUPLINGS

QUICK-CONNECTIVE COUPLINGS FOR

- AIR
- OIL
- GREASES
- OXYGEN
- ACETYLENE
- GASES
- STEAM
- HYDRAULIC



CONNECTION TAKES ONLY A SECOND

Threading fluid line couplings on and off to connect or disconnect is an unnecessary waste of time. Any line can be quickly and easily connected by using a Hansen Coupling. And, in addition, couplings have shut-off features that prevent loss of the liquid or gas in the line.

When you want to connect a Hansen Coupling, it is merely necessary to push the plug into place, where it locks securely. The valve opens, and flow starts instantly. The same operation disconnects—move the sleeve, and the plug pops out. Flow is shut off automatically.

From a wide range of available sizes and types you can select one suitable for any application. Air, oil, and gas, oxygen and acetylene, gasoline, hydraulic oil, and steam—each type of service has a Hansen Coupling engineered to meet its specific requirements.

If you have any fluid lines in your plant, you can increase efficiency, save precious minutes, by the use of Hansen Couplings.

Write for industrial catalog No. 47 today

REPRESENTATIVES

New England States: Fearse-Pearson Co., West Hartford, Connecticut, Boston, Massachusetts
Atlantic, Gulf States: B-R Engineering Co., Baltimore, Md.
Northern Ohio: F. & W. Ursem Company, Cleveland, Ohio
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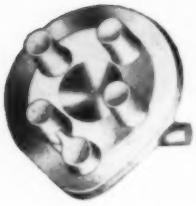
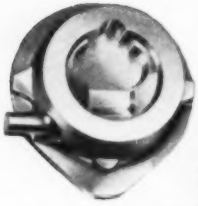
QUICK CONNECTIVE FLUID LINE COUPLINGS . . .

THE HANSEN MANUFACTURING COMPANY

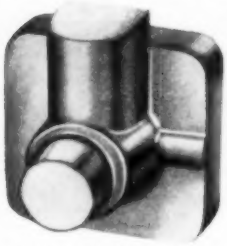
4031 WEST 150th STREET • CLEVELAND 11, OHIO





BRASS FORGINGS

are the answer where non-corroding, non-porous materials of great strength are essential



BRASS FORGINGS ARE SUPERIOR IN MANY WAYS TO SAND CASTINGS

LOWER COST: The combination of smoother surfaces, absence of porosity, better machinability, longer tool life, less chucking difficulty, closer tolerances, fewer operations, lighter weight, and practically no scrap, results in the production of a superior product at a lower cost.

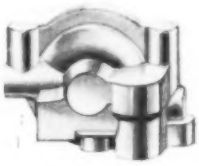
Forgings possess about twice the tensile strength of sand castings. Extreme pressures under which the forgings are produced, once during extrusion and again during forging, assures a dense, close-grained material.

Due to the absence of scale, sand, etc. in the metal, forgings can be machined at a higher rate of speed than similar parts made by other processes, and the smoothness of surface, combined with close tolerances, frequently eliminates machining operations. The life of machine tools is greatly increased.

COMPARISON OF COST OF AVERAGE BRASS FORGINGS AND BRASS CASTINGS

(Quoted Figures are approximate)

Machined — Ready to polish, buff and plate	FORGINGS COST 20% LESS	
Polish and Buff	FORGINGS COST 50% LESS	
Scrap after Polishing and Buffing	CASTINGS 7%	FORGINGS 0

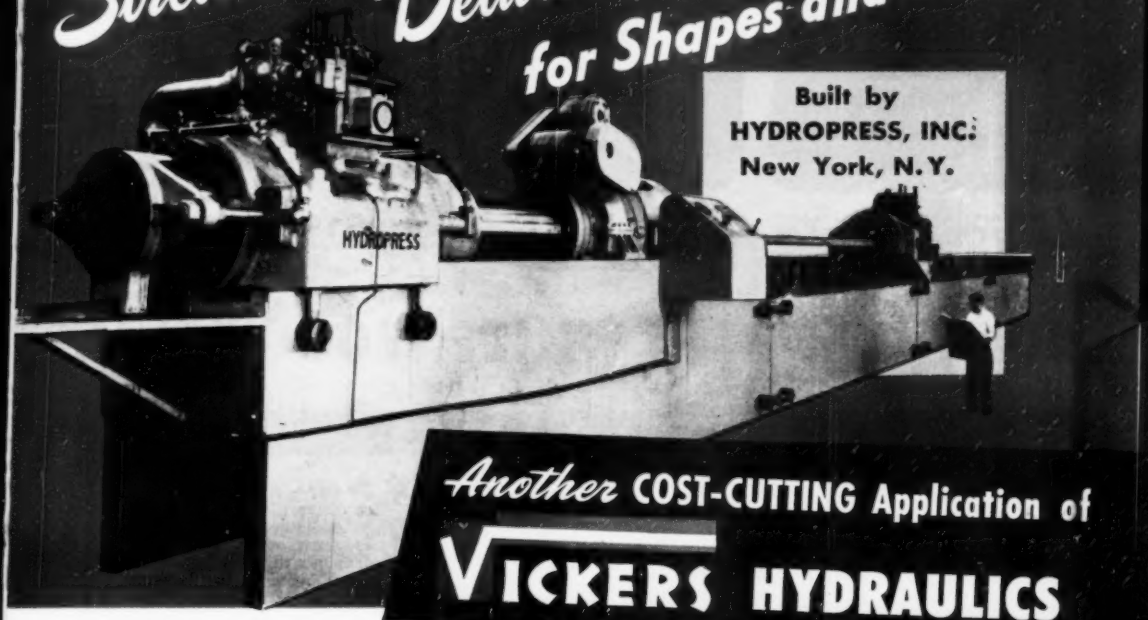


The Mueller Brass Co. is equipped to forge, completely machine, polish, buff, lacquer or plate. Let us quote you on your product in Forged Brass.

MUELLER BRASS CO.

PORT HURON, MICHIGAN

Stretch-Straightening-Detwisting Machine for Shapes and Sections



Built by HYDROPRESS, INC. New York, N.Y.

Another COST-CUTTING Application of VICKERS HYDRAULICS

Powered by Vickers Hydraulic Power Units and controlled by Vickers Hydraulic Valves, this huge machine performs detwisting and straightening operations on structural members as long as 40 feet and with cross-section lying within a 14 inch diameter circle. The stretch-straightening and detwisting operations are performed simultaneously so that torsion is applied while the section is under tension and ready to flow. The torsional and tensional stresses are sufficient to obtain immediate flow and permanent detwisting of the material with a minimum of spring back that would occur to a great extent if torsion were applied alone.

An important feature of the machine is the arrangement of movable heads that makes it possible to detwist any part of the member if localized detwisting is necessary.

This is another of the innumerable jobs throughout industry that is being done better, faster and at less cost with the help of Vickers Hydraulic Controls. Consult the Vickers office near you for information on how Vickers Hydraulic Equipment can improve your machinery.

VICKERS Incorporated • 1410 OAKMAN BLVD. • DETROIT 32, MICHIGAN

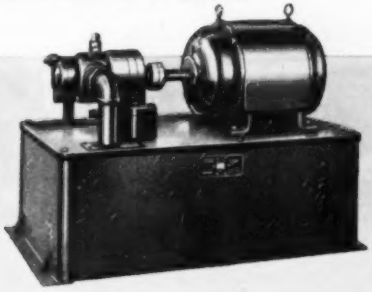
DIVISION OF THE SPERRY CORPORATION

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA PITTSBURGH • ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

14

VICKERS HYDRAULIC POWER UNIT

A compact hydraulic power package that simplifies hydraulic system design and reduces costs. Available with various pump combinations to meet wide range of requirements up to pressure demands of 2000 psi. There are 92 standard sizes and types of single stage, two stage and dual pressure pumps equipped with motors from ¾ to 20 hp. Ask for Bulletin 46-43.



1 1897—America's first cars, hand-built and expensive, looked like this. Big questions of the day were—will it run? can I ever afford to buy one? Little thought was given to washing a car.

2 1915—Howell "Red Band" Motors arrived. The electrical horsepower age was already under way. Automobiles, as well as other goods and services, were soon to be better, cheaper.

3 1935—This combination brush and spray was one of many early car-washing devices. It wasn't until 1945 that modern assembly line methods began to be applied to the washing of cars.

NOW, A WASH WHILE YOU WAIT!

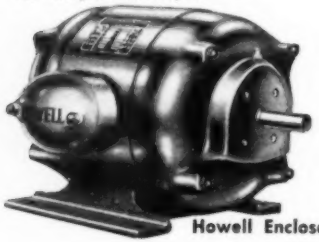
4 Today—Automatic car washers, like this, equipped with nine totally enclosed Howell Motors, turn out a glistening, clean car in a jiffy! Back-breaking labor is gone, valuable time is saved—all so that more people can enjoy better living at less cost.

Working in a shower of water is a tough job for electric motors. But, here again, Howell Motors have made good. These rugged, industrial type motors are an important source of power not only for car washing but also for fans, pumps, conveyors, dairy machines, and all other important industrial jobs.

Are you using Howell Motors? Try them!

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Howell totally enclosed motor built for operation in high humidity atmosphere. Remember, there's a Howell Motor for *every* industrial job.



Howell Enclosed or Splash-Proof Motor

HOWELL MOTORS

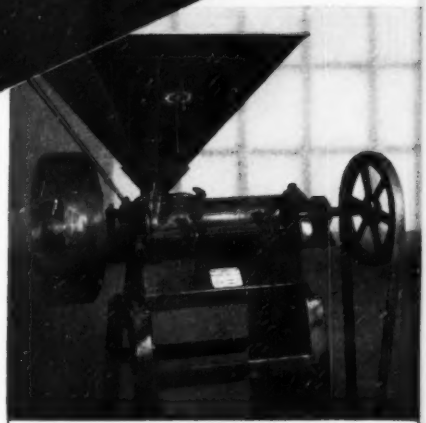
HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

HOWELL Red Band MOTORS

Third in a series of
Unusual Abrasive
Products Operations

GETTING WHEAT READY FOR BREAKFAST!



Photograph, Courtesy of Marcus Mason & Co., Inc.

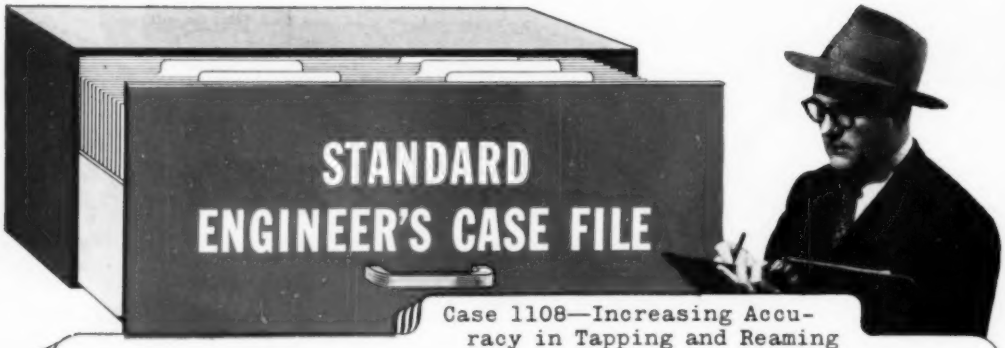
● Bay State abrasive shell liners are used in hulling machines for removing the bran and shining the wheat grain before it is made into puffed wheat.

Whatever *YOUR* grinding problem may be, *BAY STATE* can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States.

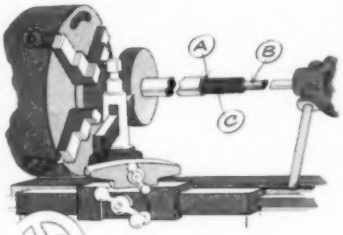
Send us your grinding problems. We can help you.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.
Branch Offices and Warehouses—Chicago, Cleveland and Detroit
Distributors—All Principal Cities

Top Performance Consistently Duplicated



Case 1108—Increasing Accuracy in Tapping and Reaming



REAMING IN LATHE

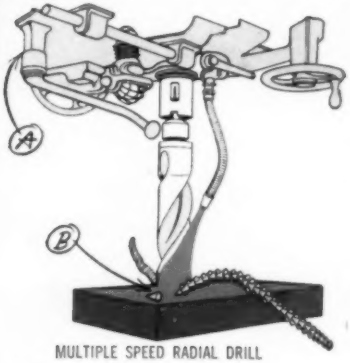
When tapping and reaming gun barrels from steel treated to a Rockwell of 35-36, Calol T. R. Compound diluted with a transparent cutting oil obtained better accuracy and made tools last longer than any other lubricant. The 25-inch barrels were machined to an inside diameter of 1.045 and concentricity was held to under .005. Calol T. R. Compound also helps solve problems of scuffing of work, and welding of work to tool in drawing, forming, punch press and other operations.

A. Contains two very active extreme pressure additives, prevents tearing of metal, promotes clean, smooth work finish, and allows faster speeds, increasing production.

B. Has consistency of a No. 0 grease . . . may be diluted with active Calol Cutting Oils without losing extreme-pressure qualities. Dilution with Calol Vistac Oil, aids adhesive characteristics. Light engine oils may be used.

C. Easily applied with brush or swab.

Case 1146—Selecting the Correct Cutting Fluid



MULTIPLE SPEED RADIAL DRILL

In tests on machine tools of all different types, the Calol Cutting Fluid recommended for each operation produced fine surface finish on work. This is because recommendations for Calol Cutting Fluids are made from actual working results — tests made on a special drillpress, the Drilling Torque Tester — and the results recorded by electronics. Calol Cutting Fluids come in four general classes: mineral oils, ready-mixed compounded oils, concentrates and soluble oils.

A. Made for every machining operation — from toughest broaching to simple grinding.

B. Lubricating, cooling and flushing qualities assure longer tool life and better work finish.

Calol Cutting Fluids also give maximum rust protection to machine tools and work. The soluble oils in the line mix with water easily and form strong, stable emulsions.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, N. J.—Chicago, Ill.

The California Company
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CALOL

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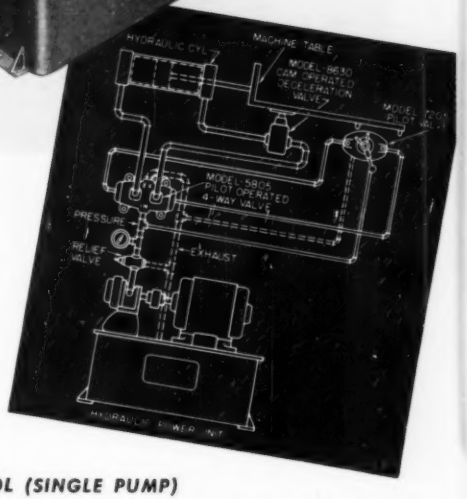
YOU GET A

Complete Package

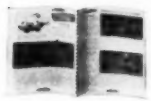
-with a GEROTOR POWER UNIT



Gerotor offers the Series 9100 Pump Unit as the ideal source of power for your hydraulic circuit. In addition to the highly efficient Gerotor pump, the unit is equipped with relief valve, oil filter, pressure gauge, and all equipment to furnish a steady flow of oil at continuous working pressures up to 1000 P.S.I. Reservoir is available in 5 tank sizes, with pump capacities from .4 G.P.M. to 40 G.P.M. Motor mounting may be arranged for any standard frame. Gerotor double pumps are supplied for installations of two separate circuits.

REMOTE PILOT OPERATED CONTROL (SINGLE PUMP)

Starting the electric motor results in the continuous reciprocating of the cylinder rod. In one position of the Model 5805 Pilot operated 4-Way valve, oil is directed from the pump to the blind end of the hydraulic cylinder, causing the cylinder to extend at its rated speed. When the machine table advances to where it depresses the cam of Model 8630 flow control valve, the forward speed of the cylinder is affected by the setting of the flow adjusting screw of Model 8630 valve. In the other position of Model 5805 valve, oil is directed from the pump to the rod end of the hydraulic cylinder causing it to retract at full rated speed. In this direction of cylinder movement, Model 8630 has no effect on the speed of the cylinder. Model 7205 Pilot valve provides for remote hydraulic operation of the main 4-Way valve, Model 5805. The forward, or return stroke of the cylinder may be manually interrupted at any time by reversing the handle of the Model 7205 Pilot valve.



Write for Catalog Section G-105 showing specifications and description of Gerotor Hydraulic Pump Units.

GEROTOR MAY CORPORATION • Dept. AM-5, Baltimore 3, Md.

WHEN YOU APPLY HYDRAULIC OR AIR POWER *Plan with* **GEROTOR**

AIR AND HYDRAULIC VALVES AND CYLINDERS, HYDRAULIC PUMPS, MOTORS AND PUMP UNITS

It took 35 years to write this "book"

...and only PARKER-KALON could do it!

ORIGINATORS of the Self-tapping Screw, pioneers in new designs, and *specialists* in the manufacture of this type of fastening, Parker-Kalon alone can offer the wealth of invaluable information represented by this "volume". That's why . . .

more Fastening-wise Manufacturers Call on Parker-Kalon

More "know how" is just one of the *extras* you get when you choose P-K Self-tapping Screws. Look at all these advantages:

CALL IN A PARKER-KALON ASSEMBLY ENGINEER and let him apply this unparalleled experience to your assembly problems. Find out how you can simplify assemblies, improve strength, save time and lower production costs with the simpler P-K method. If you prefer, mail assembly details for recommendations. Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y.

MORE "SHOW HOW" — P-K's staff of Assembly Engineers has helped solve nearly a million application problems.

MORE TYPES AND SIZES — With a complete line of Self-tapping Screws for every metal and plastic assembly, P-K's advice is unbiased.

MORE EXACTING QUALITY CONTROL — P-K's investment in laboratory testing and inspection equipment is unsurpassed.

MORE PRODUCTION — Parker-Kalon is the world's leading manufacturer of Self-tapping Screws.

MORE TOP-RATED DISTRIBUTORS — Everywhere throughout the nation, P-K Self-tapping Screws are readily available.

AND NOW . . . PROMPT DELIVERIES from stock on most types and sizes

REMEMBER . . . YOU'RE *O.K.* WITH *P-K!*

P-K®

The Original

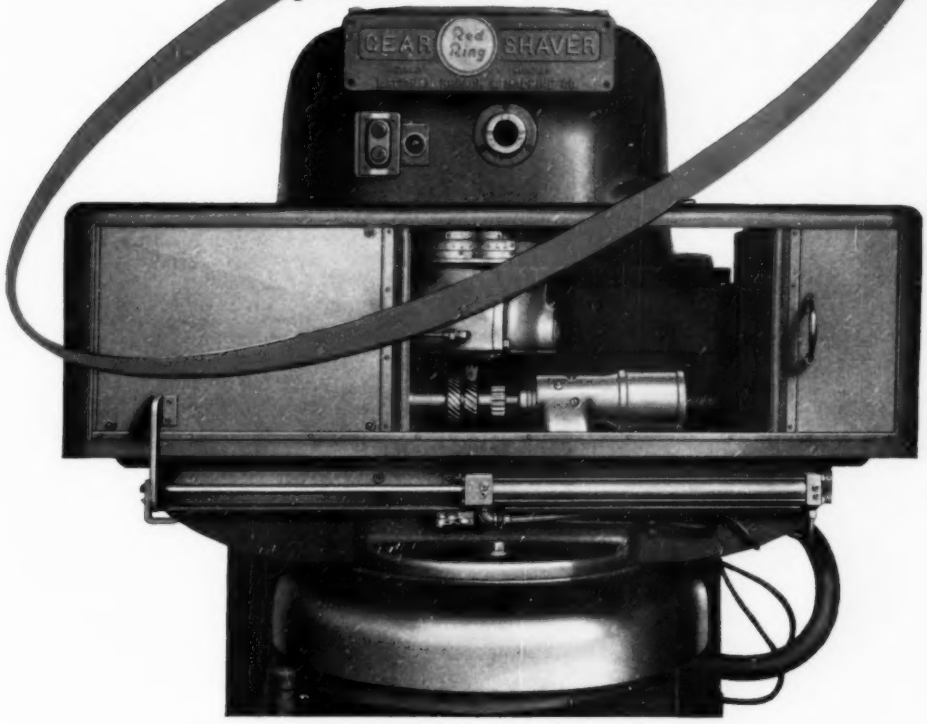
PARKER-KALON SELF-TAPPING SCREWS

FOR EVERY METAL AND PLASTIC ASSEMBLY

P-K Also Makes *Cold-forged*

OTHER P-K PRODUCTS Cold Forged Socket Screws, Wing Nuts, Thumb Screws • Hardened Screwnails and Masonry Nails • Shur-Grip File and Solder Iron Handles • Metal Punches • Damper Regulators and Accessories

SEMI-AUTOMATIC operation speeds GEAR SHAVING



Two new Red Ring developments make it practicable to put gear shaving on a semi-automatic basis and increase production rates substantially.

These are the air operated tailstock and the air operated, electrically controlled automatic splash doors. The former clamps the work gear quickly and accurately in shaving position. After loading the operator presses a start button which automatically closes the splash doors, starts the flow of coolant and the automatic shaving cycle. When this cycle is completed, coolant is cut off and the doors open automatically for unloading.

For small gears, this reduces loading time up to 50% and on all gears it minimizes operator fatigue.

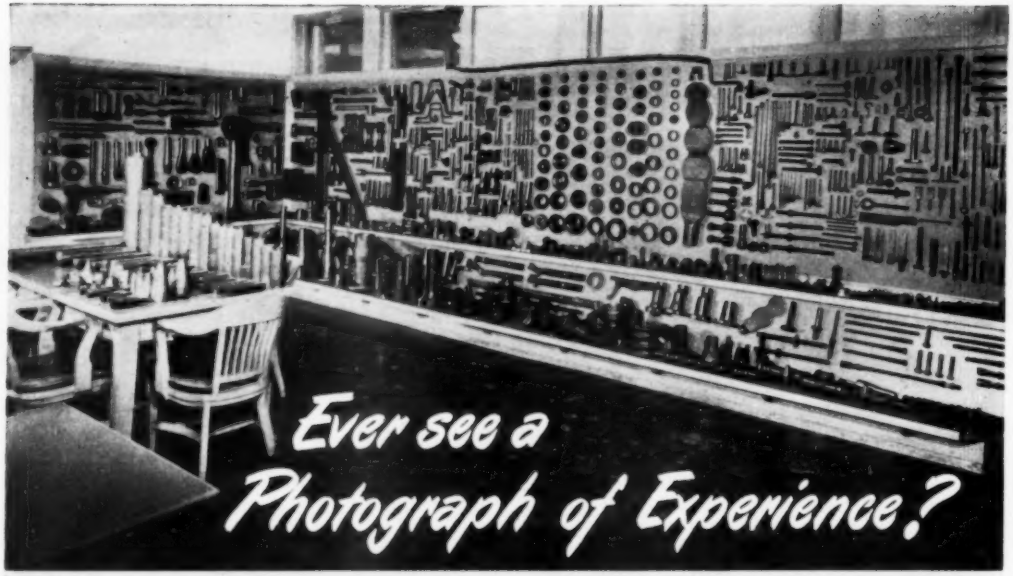
Write for details and quotations.

SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



You'll probably find the answer to your forging problem here in our display room, where you can see the correct answers to 10,000 forging problems!

It's possible that you may recognize some of these forgings as the answer to a forging problem which once troubled you. Or, maybe in looking at some of these solutions they may suggest the formulae for solving a forging problem you now have, which is crying for solution.

We have had years of experience in originating, developing, and improving hot and cold forging equipment, as well as the dies and tools which are such an important part of National forging technique.

75th Anniversary 1874-1949

THIS DOOR IS ALWAYS OPEN

Our Engineering staff, our entire organization is always at your service. Send us blue prints, a sample of the part you wish to make, or better yet, visit us. We're proud of our plant. We'd like you to meet our people—see our production facilities. Chances are, we can come up with the answer to your forging problem. A warm and sincere welcome awaits you.

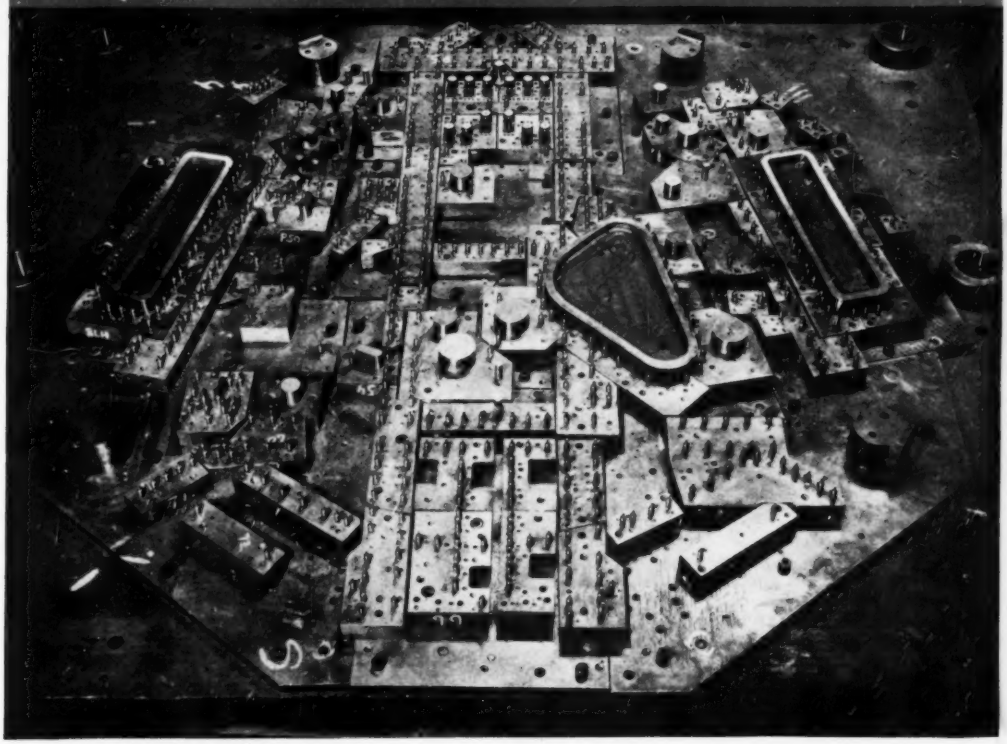
NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET, AND WIRE NAIL MACHINERY

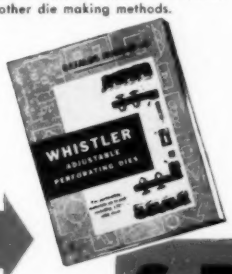
New York Detroit Chicago

It just doesn't make sense

to tie up manpower and spend money needlessly when there are quicker, more economical ways of doing the same job better.



Here is the punch arrangement of a 70" x 84" Perforating Die set weighing approximately 6 tons. You can see for yourself the cost and production advantages of *removable* units and sections over other die making methods.



THE BEST KNOWN names in industry have found this catalog very useful.

Whistler's way of making up precision dies with *removable* parts is now standard practice in hundreds of production and cost-minded metal working plants. Use Whistler drill jigs for drilling the retaining screw holes. Make up your own dies using Whistler *removable* and *interchangeable* punches, dies, strippers and other parts. Round punches and dies from 1/32" to 3" diameters are carried in stock. Special shapes quickly made to order. Prove to yourself the remarkable economies in dollar outlay and days quicker in production. ***Better write us and ask for Catalog No. 48.***

S. B. WHISTLER & SONS, Inc.

738 MILITARY ROAD — BUFFALO 17, NEW YORK

THE CHIPS ARE OUT... COLD

here's why

Modern machine tools give top performance with LUSOL, the up-to-date coolant that withdraws generated heat from work, chips, and tools more rapidly than either cutting or soluble oils. A true solution that wets metal surfaces quickly, it results in much lower operating temperatures . . . with consequent high production. Tools last longer, work can be held to closer limits.

Whatever the job . . . grinding, broaching, milling, drilling, etc. . . . you can be sure of better performance with Lusol. Try it yourself . . . write, wire, or phone today for test sample.

USE *Lusol* THE TOOL SAVING COOLANT

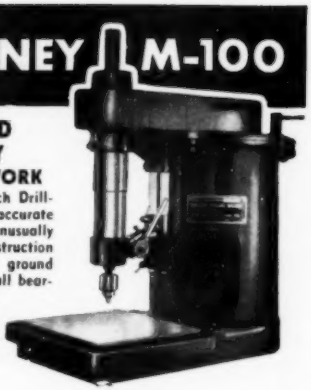
② CASE HISTORY		
MACHINE	OPERATION	MATERIAL
Snyder Horizontal Multiple Spindle Drilling & Tapping Machine	Drill 11/16" hole 7/8" deep. Tap 3/4"-No. 20	Steel Casting
PRODUCTION		
OTHER COOLANTS	LUSOL	
1984 pieces in 50 hrs. using 41 drills, 25 taps	2060 pieces in 50 hrs. using 12 drills, 8 taps	

Saved with Lusol 29 DRILLS 17 TAPS

F. E. ANDERSON OIL COMPANY
PORTLAND, CONNECTICUT
RUST PREVENTIVES • SPECIAL INDUSTRIAL FLUIDS • CLEANERS

Distributors in Syracuse, Cleveland, Toledo, Detroit, Chicago, Milwaukee, Louisville, Philadelphia, Dallas, Houston, Los Angeles, Denver, Tulsa
2AN49

SIGOURNEY M-100



MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service.

This sturdily constructed bench drilling machine is available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

Send for Illustrated Bulletin

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

Sole Sales Agents
PRATT & WHITNEY
Division Niles-Bement-Pond Co. West Hartford, Connecticut

For Straight Hardening
LONG, SLENDER HIGH-SPEED STEEL TOOLS, SPINDLES, BROACHES, REAMERS, ETC.

SENTRY MODEL YP VERTICAL FURNACE

SENTRY
MODEL YP
VERTICAL
ELECTRIC FURNACES

Large or long, slender high-speed steel tools, broaches, spindles, etc. are best hardened in the specially designed Sentry Model YP Vertical Electric Furnace. Employs the Sentry Diamond Block Method of Atmospheric Control for maximum quality hardening of molybdenum, tungsten or cobalt high-speed steels. No scale or decarburization.

Finished work is smooth, dimensionally correct and true to shape, saving costly finishing operations.

Sentry Electric Furnaces are made in sizes and capacities to meet your requirements.

You'll be interested in our latest catalog. Ask for bulletin YP-51

The Sentry Company
FOXBORO, MASS., U.S.A.

STANDARD

DIAL INDICATORS and INDICATING GAGES

The Ultimate in speedy, easy-to-read, precision gaging!

Decimatic SERIES

American Gage Design mounting dimensions. Decimal graduations. Modified range. Thin red, "no-whip" hand. For close tolerances.

REGULAR SERIES

American Gage Design specifications throughout. Large variety of sizes and graduations. Also 90° (stem perpendicular to dial face), Long Stem and Long Range models.

Micronar

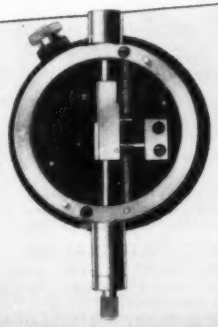
Quadrant type, for exceptionally close tolerances. High amplification. Graduated .00002" in central section of dial. Metric markings available.

Two examples of popular STANDARD Indicating Gages. Also available are encased and Decimatic types of Dial Snap Gages, Dial Depth and Dial Pin Gages.

COMPARATOR DIAL SNAP GAGE

DIAL BORE GAGE

STANDARD'S Shockproof Mechanism



STANDARD Shockproof Mechanism used in most models, not as an optional "extra", but furnished regularly as another of the many STANDARD features. Absorbs shocks *before* they reach gearing, preventing damage due to sudden or forceful application of work pieces. Prolongs life of instrument and minimizes repairs.

Let Us Know Your Requirements

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

A Fountain Favorite...

POURS THROUGH SANITARY VALVES OF *Free-Machining* ENDURO STAINLESS STEEL

There's no compromise with quality when it comes to protecting the taste and purity of America's favorite soft drinks. That's why sanitary, easy-to-clean, corrosion-resistant ENDURO Stainless Steel (Type 303) is used for these fountain dispenser valve parts.

From a manufacturing standpoint, there are other reasons, too, for the specification of ENDURO Cold Finished Bars. Close tolerances . . . accuracy of section . . . uniform soundness . . . fine surface finish . . . and UNIFORMLY HIGH MACHINABILITY . . . all combine to keep down unit costs and reject losses.

Whenever you need top machinability plus one or more of the other qualities which only stainless steel can provide, remember to specify Republic ENDURO Stainless Steel Bars—cold finished or hot rolled—and wire. Available for prompt delivery. Write us *today*.

A VALUABLE AID FOR MACHINISTS

It's a handy Speed and Feed Selector to help you in machining stainless steel. Send for one TODAY. . it's FREE.

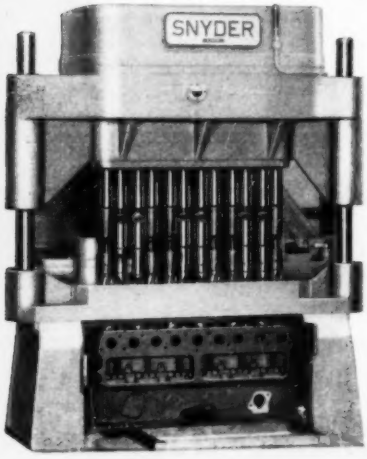
REPUBLIC STEEL CORPORATION
ADV. DIVISION • DEPT. A M
3100 East 45th Street
Cleveland 4, Ohio

Republic ENDURO FREE-MACHINING STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

SNYDER *Machines Cost Less in the Long Run*



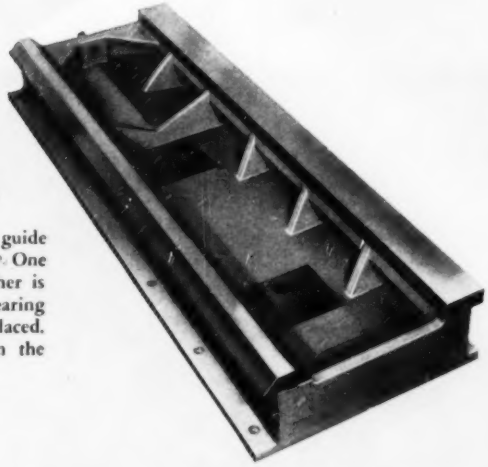
SNYDER MACHINES USE THEIR HEADS TO SAVE MONEY

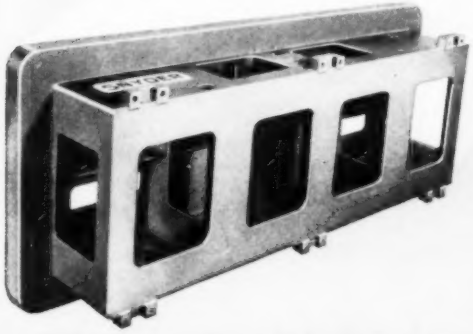
A good machine can use its head to save you money. On Snyder heads, for example, spindles, idlers, drivers and pump drive gears are mounted in ball bearings with circulating lubrication. Every time a shaft or gear turns, money is being saved for you. Most heads are built with pick-off gears to cut down time in making speed adjustments. Multiply these savings over a span of 20 years and it is obvious that Snyder craftsmanship costs less in the long run.

HARD WAYS TO MAKE MONEY FOR YOU

A Snyder feed unit may travel as much as 25,000 miles in the course of a machine's lifetime, so what it travels *on* is important.

We mount feed units on hardened and ground ways or guide bars — hardened for wear, ground for super-smoothness. One of the ways is V-type to keep accurate alignment, the other is flat. They are anchored from the bottom—no holes on the bearing surface to catch grit. They are easily and inexpensively replaced. This top notch craftsmanship costs just a little more in the beginning but saves you plenty in the long run.





SAFE ON BASE—IF IT'S A SNYDER

You might be surprised at how much attention we give to "tailoring" the base so that it properly supports the machine members—and blends with the design. We use welded steel or cast iron, heavily ribbed, normalized and sand blasted and equipped with properly located leveling screws and hold-down blocks. We lavish attention on the humble base because it is the backbone of every machine and therefore the number one rigidity factor. A good one will always save you money in the long run.

SNYDER

TOOL AND ENGINEERING COMPANY
3400 E. LAFAYETTE
DETROIT 7, MICHIGAN

24 Years of Successful Cooperation with Leading American Industries

THE TRACTORS

WHICH PUSH A NEW

HIGHWAY THROUGH...

are built on metalworking assembly

and for what it takes to make them..

Photos courtesy Caterpillar Tractor Co.

...lines...

Well over 1,000,000 tractors to speed farm work, push new highways through, step up factory and housing construction, were built by Metalworking last year. As a matter of fact, this biggest and most basic industry built the machinery and equipment *every other industry* bought to produce its own products . . . also manufactured many of the consumer products which head everyone's buying list.

What's more, Metalworking keeps on growing; among Metalworking's thousands of products, 5,280,000 automobiles, 4,750,000 washing machines, 108,000 freight cars, 19,000,000 fractional horsepower motors, 2,000 diesel locomotives helped to make 1948 Metalworking's biggest peacetime year. Plant capacity is up, too . . . by 180% since 1939 in electrical machinery, 150% in transportation equipment, 30% in automobiles.

Do you sell production machinery, equipment, materials, or services Metalworking can put to work this year? Metalworking wants them if you do . . . for 1949 production goals are high . . . plant expansion is continuing . . . and higher productive efficiency is the keynote which sparks the planning of Metalworking's production management.

If you do sell to Metalworking, **American Machinist** is the place to concentrate your advertising dollars. This is the one all-paid circulation magazine edited exclusively for the Metalworking Industry and for the metalworking production executive specifically. It gives you more readers . . . more readers with buying power . . . more readers who *want* to buy than any other metalworking publication. And right now over 600 **American Machinist** advertisers are selling their products to over 28,000 **American Machinist** *paid subscribers* who constitute Metalworking's biggest concentration of top buying power.

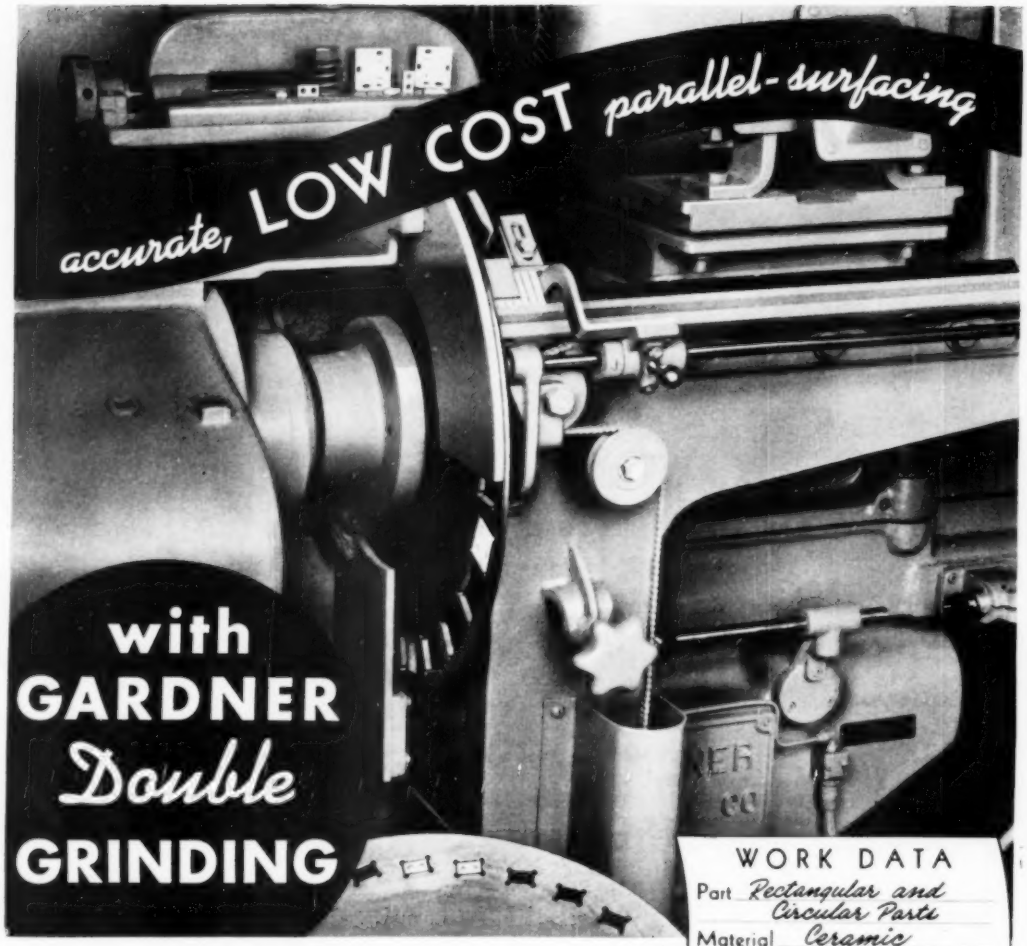
The eleven divisions of America's basic industry

- Transportation Equipment, Parts, and Accessories
- Food and Farm Machinery
- Household Equipment and Appliances
- Business Machines and Appliances
- Metal-fabricating Machinery
- Construction, Mining, and Power Equipment
- Electrical Machinery and Equipment
- Processing and General Industrial Equipment
- Army Arsenals, Navy Yards, and Air Bases
- Tools, Machinery Components, and Small Metal Parts
- Machine Shops in Non-metalworking Plants, Contract Work Shops, Tool and Die Shops

..Metalworking looks first in.... American Machinist

ABC ABP

The McGraw-Hill Magazine of Metalworking Production
McGraw-Hill Building, New York 18



GARDNER *Double* GRINDING is reducing the unit cost of parallel-surfacing — in spite of rising wage rates — and is helping maintain extreme accuracies, while assuring increased production on dozens of jobs.

A typical example, in the ceramic industry, is shown above. The trough-type feeder, rotary work carrier and automatic unloading arrangement make this Gardner No. 115-15" Double Grinder, a purely semi-automatic tool. TWO sides of each part are ground with ONE pass through the machine.

Let our engineers recommend a GARDNER *Double* GRINDER that will do more accurate, lower-cost parallel-surfacing for you!

WORK DATA

Part *Rectangular and Circular Parts*
Material *Ceramic*
Operation *Grind Parallel Faces*
Tolerances *.0005" for Parallelism, .002" for Uniformity*
Stock Removal *.018" Maximum Overall*
Production *40 to 50 Pieces Per Minute*
Feed *Hand Load to Trough-feeder; Automatic Unload*
Machine *Gardner #115-15" Double Grinder*

GARDNER-GRIND YOUR *Flat* SURFACES

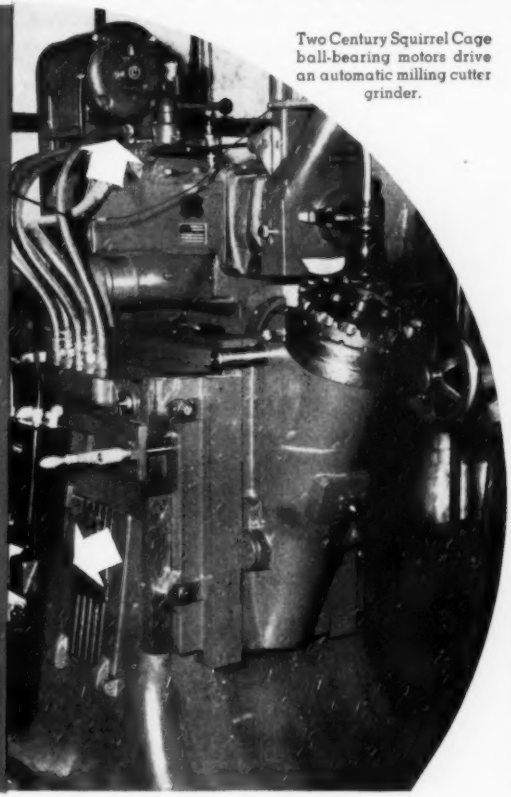
Write for Latest Bulletin on Gardner DOUBLE Grinding!

GARDNER MACHINE COMPANY
414 East Gardner Street . . . . Beloit, Wisconsin, U.S.A.

Designed to Protect the Accuracy of your Equipment—

Century MOTORS

Help Maintain Tool Room Precision on Production Jobs



Two Century Squirrel Cage ball-bearing motors drive an automatic milling cutter grinder.

Popular types and standard ratings are generally available from factory and branch office stocks.

Century motors are designed, produced and tested to give you all the precision your machine was designed to provide.

Century motors' unusual freedom from vibration contributes to closer tolerances, smoother operation and fewer rejects. These motors are precision built to close tolerances—ruggedly designed to maintain alignment—and are carefully balanced, electrically and mechanically.

Century motors are built in a wide range of types and kinds, in sizes from 1/6 to 400 horsepower—for operation on single phase, three phase and direct current.

Specify Century motors for all your electric power requirements.

Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

-630

When you need the right gear *in a hurry*

It's one thing to get a gear cut exactly to your specifications . . . and another to get it *on time.* To be sure of satisfaction *both* ways, there's only one safe thing to do: specify Grant gears. For, whether you order by 'phone, telegraph or letter, Grant will have just the gear you want on its way in a matter of hours.

Next time a gear breakdown threatens a costly production tie-up, remember Grant's "in-the-pinch" service. Send today for free catalog of "In Stock" gears.

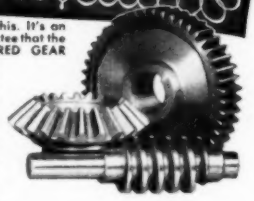
Reduction Units?
Grant has all types.
Write for catalog.

GRANT GEAR WORKS, INC.
169 W. SECOND STREET
SO. BOSTON, MASS.

Grant FOR GEARS

HERE'S NEWS!
GUARANTEED GEARS

No idle promise, this. It's an unqualified guarantee that the Pittsburgh ARMORED GEAR Line will give you longer life than you have ever thought possible . . . to lower your gear maintenance costs and increase production by reducing time-consuming shut-downs. Tell us your requirements.



DISTRIBUTORS' INQUIRIES INVITED

PITTSBURGH GEAR COMPANY | 27th & Smallman Streets PITTSBURGH 22, PA

QUALITY GEARS FOR OVER 30 YEARS

CUTTING *its first teeth!*

This big baby is getting a set of teeth that will give years of faithful service in a heavy duty installation. Stahl methods will see that every step in the process, from preliminary selection of the steel to the final inspection and shipment, are carried out by the most advanced methods, on the latest type of equipment, under the supervision of men with years of practical experience.

For spurs up to 72" P.D. 1 D.P. . . . for bevels to 54" P.D. 1 D.P., for spirals and helicals to 38" P.D. 2 D.P., worm gears to 48" P.D. 2 D.P. . . . for fabroil, bakelite or rawhide gears . . . any size . . . for racks to 20' long 3 D.P.—or internals 25" P.D. 3 D.P. . . . *get a Stahl estimate first!*

STAHL GEAR & MACHINE CO.
3901 Hamilton Ave., CLEVELAND 14, OHIO

GANSCHOW CUT GEARS

SPUR—SPIRAL
BEVEL—RACK
AND PINION

UP TO 60" PITCH DIA.
UP TO 10" FACE WIDTH

GANSCHOW GEAR CO • 14 N MORGAN ST CHICAGO 7

QUALITY GEARS CUT TO ORDER

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the one gear suited for your job.

MEISEL PRESS MFG. CO.
946 Dorchester Avenue Boston, Mass.

GEAR CUTTING MACHINES

Well Designed . . . Good Features
Create Production Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 PROSPECT ST., NEWARK 5, N. J.

ATLANTIC GEARS

precision-cut and inspected, on new, latest equipment. All sizes and types. Send samples or blueprints for quotation.

ATLANTIC GEAR WORKS, INC.
200-D Lafayette St., N. Y. 12, N. Y., CAnal 6-1441

GEAR ECONOMY BEGINS WITH BRAUN

The Braun Gear Company has been shaping the wheels of industry for more than 38 years, producing gears of quality at economical prices. Braun's brand new plant is now more than ever equipped to supply the things that count in gears—precision workmanship, fine materials, good design, and prompt service.

Send samples or prints and specifications for immediate quotations. Whether your requirements are for one gear or thousands, you will find that economy begins with Braun!

BRAUN GEAR COMPANY
239 Richmond St., Brooklyn 8, N. Y.

Gears, Good Gears Only

TO MEET Your PARTICULAR NEEDS

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPROCKET
- ★ INTERNAL
- ★ ZEROL
- ★ CONIFLEX
- ★ SPIRAL BEVEL

Each Cincinnati Gear is made to fit a particular requirement from job specifications.

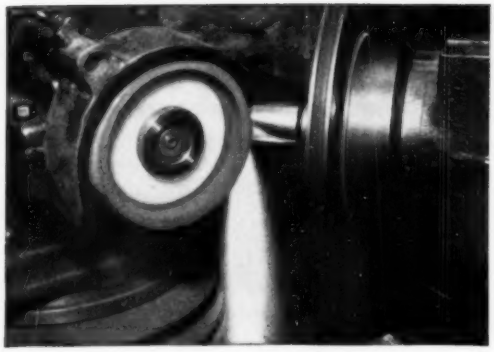
Cincinnati Gears, Good Gears Only, have the built-in accuracy and precision that make possible outstanding performance records.

Let Cincinnati Gears, Good Gears Only, work for you . . . they will meet your every job requirement.

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

The Monthly Robertson Bulletin

TOOL SALVAGE



PRODUCTION COSTS are in everyone's mind these days. Tool costs, of course, have a very important bearing on production costs, and reconditioning tools can be a big factor in your drive for economy.

Reconditioning tools is not at all difficult if you use a Robertson "Cool-Cut." Because of the open structure of this wheel, the grains remove the metal rapidly . . . yet you obtain a finish equal to that produced by a close-grained, conventional wheel.

Here is one example of the sort of work a "Robertson" does on a tough reconditioning job. A 6" x ¾" high-speed milling cutter was re-cut in 15 minutes. A regular conventional wheel required 40 minutes to do the same job.

Tip and steel of steel-and-carbide reamer blades, inserted-tooth milling cutters and other carbide-tipped tools can be ground in the same operation without glazing the wheel or generating excessive heat. Small reamer blades, for instance, can be successfully ground with .002" down feed and .015" cross feed. Robertson Wheels for this operation range from 7" x ½" to 12" x 1" in size.

For the best results from any grinding operation, make sure your grinding wheels are "Robertsons" . . . the wheels that are precision-built for the toughest jobs. Write for your free copy of the interesting pocket booklet, "How to Buy Production Time."

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

RESIN-BONDED AND VITRIFIED-BONDED GRINDING WHEELS • MOUNTED WHEELS • SEGMENTS

GEARS made to your SPECIFICATIONS FASTER AT LOW COST

You get high quality gears cut exactly to your specifications and you get them faster the Capitol way!

Over 40 years experience have made Capitol famous for quality materials, precise workmanship and dependable performance. A large modern shop is available for cutting—SPUR • BEVEL • HELICAL • HERRINGBONE • MITRE and many other types of gears. If you need large gears for heavy machines or small gears for timers, cameras, etc. . . . you can depend on CAPITOL Gears to run smoothly and quietly.

Always specify CAPITOL gears

SEND PRINTS TODAY for money and time-saving quotations. PROMPT DELIVERIES.

AUTO ENGINE WORKS, INC.
341 A N. HAMLINE AVE. ST. PAUL 4, MINN.

HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.

Severance CARBIDE MIDGET MILLS

¾ SIZE

Operate at grinding-wheel speeds
Outlast scores of mounted points
Cut 50 times faster
MANY SHAPES and SIZES
Cut hard materials - Rockwell 65-C
Write for Catalog No. 16
May be REGROUND time-after-time by Severance—savings are thus multiplied

SEVERANCE TOOL INDUSTRIES, INC.
725 Iowa Ave. Saginaw, Michigan

gears

MORE FOR YOUR MONEY

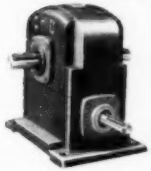
Send us a blue print and we'll be glad to prove it to you.

GREAT ACCURACY AT COMPETITIVE PRICES!

SAN DIEGO GEAR WORKS 3691 Couts St. San Diego 1, Cal.

HOW MUCH will one of these

OHIO SPEED REDUCER HS SERIES STANDARD CASE



Single reducers. 5 sizes, No. HS-0-1-2-3-4. Ratios, 5-1 to 100-1. Capacities, ¼ HP to 5 HP. Higher HP is attained in the heavier cases (with low ratios). The input shaft or worm is below, the output shaft above. Output shaft may extend to right, to left, or both right and left.

OHIO HELICAL SPEED REDUCER, SINGLE REDUCTION

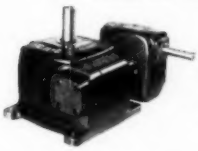
The HH line of Helical Reducers is available in 3 sizes; Nos. HH-1-2-3. Ratios are from 3-1 to 12-1. Torque capacities 147 in. lbs. to 1450 in. lbs. The double reduction unit No. DHH2 has ratios ranging from 9 to 1 to 30 to 1, with capacity of 1300 inch lbs.

OHIO DOUBLE SPEED REDUCER D-SERIES

For heavy duty service, Nos. DOT and D-1-3-4-5-6. Radial thrust bearings on high speed shaft, tapered roller bearings on all others, except No. DOT, with tapered roller bearings. Ratios to 3200 to 1. Torque capacities, 25 to 12000 in. lbs.

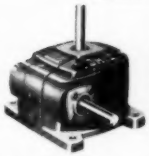
OHIO GEAR speed reducers

OHIO DOUBLE SPEED REDUCER DPL



Double reduction in DPL series is obtained by adding an attachment case to PL single reducer. Three sizes, Nos. DPL-1-2-3. Ratios, 100-1 to 24000-1. Torque capacity, 900 in lbs. to 5800 in lbs.

OHIO SPEED REDUCER PL SERIES VERTICAL OUTPUT



Four sizes, PL-0-1-2-3. Ratios, 5-1 to 100-1 Capacities ¼ HP to 4 HP. Output shaft is vertical and extends from top of case, from bottom of case, or both top and bottom. Higher HP is attained in the heavier cases (with low ratios).

OHIO MOTORIZED SPEED REDUCER

Worm gear of special gear bronze. Worm and motor shaft of hardened steel, integral and ball bearing mounted. Output shaft extra heavy, mounted on roller bearings. Motor precision built of drip-proof construction. Heavy duty ball bearings throughout. Available in ¼ and 1/3 HP, 115 and 230 volt, single phase and 220 440 volt 3 phase.

CUT YOUR COSTS?

You can make substantial cuts in the drive costs of the machines you build and the equipment you use by specifying Ohio Gear Stock Speed Reducers. They save you and your customers money in these three ways:

1. They are *stock* so they save the extra cost of special orders.
2. Readily available, they eliminate waiting time for special orders.
3. Parts and replacements are quicker, saving expensive down-time.

Ohio Stock Reducers are available in ratios from 3:1 to 24000:1; single reduction capacities from ¼ H.P. to 15 H.P.; double reductions from 25 in. lbs. to 12000 in. lbs. torque.

SEE OUR CATALOG IN SWEET'S

Check the advantages amd savings you can make by using "Ohio Stock" reducers for your own use.

ESTABLISHED 1915

THE OHIO GEAR COMPANY

1326 EAST 179th STREET • CLEVELAND 10, OHIO

OHIO GEARS

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*Akron, Ohio
Hardware & Supply Co.

Buffalo, N. Y.
F. E. Allen

*Buffalo, N. Y.
S. H. Pooley Belting Co.

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Schrade-Batterson Co.

Dayton, Ohio
E. C. Hawk Co.

Detroit 26, Mich.
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*Detroit 6, Michigan
Eynon-Dakin Co.

*Findlay, Ohio
Bearing & Transmission Co.

*Grand Rapids, Mich.
F. Ranniville Co.

*Hagerstown, Md.
Hagerstown Equipment Co.

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J .W. Minder Chain & Gear Co.

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*Minneapolis, Minn.
Industrial Supply Co.

*Muskegon, Mich.
Lake Shore Machinery & Supply Co.

*New York 12, New York
Atlantic Gear Works

*New York City 13, N. Y.
Patron Transmission Co. Inc.

*North Kansas City, Mo.
Sesco Engineering & Supply

Pawtucket, Rhode Island
George G. Pragst

*Philadelphia 6, Pa.
Robert L. Latimer Co.

*Philadelphia 6, Pa.
Rothman Belting & Equipment Co.

*Pittsburgh, Pa.
Standard Machinists Supply Co.

*Portland, Oregon
J. W. Minder Chain & Gear Co.

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*San Francisco, Calif.
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The Essmueller Co.

*Syracuse, N. Y.
Uplinger and Sherman

*Toledo, Ohio
The Bearing & Transmission Co.

IN CANADA

*Montreal, Quebec, Canada
John Braidwood & Sons, Ltd.

Stocks Carried

Protect this VITAL PART of Your Machines!

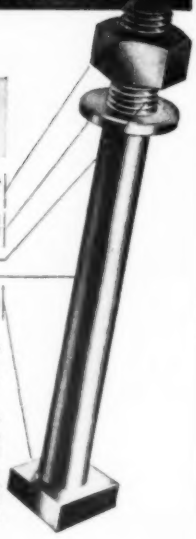
NUT of alloy steel, heat treated with Class 3 fit thread, and washer face commercially square with threads.

WASHER heat treated steel, chamfered edges. Ground to uniform thickness and hardened.

THREADS Class 3 fit.

SHANK ground for accuracy.

HEAD Machined square with shank. Square, flat surface of head fits machined surface of T-slot.



It is cheaper to use precision made bolts than to repair expensive machines. Poorly made bolts of soft steels can quickly ruin the accuracy of a machine.

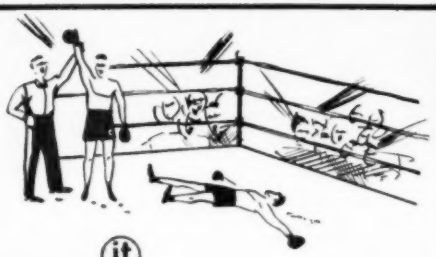
Boyar-Schultz S. M. B. Bolts are made to protect the T-Slot. They are precision made from upset alloy steel forgings and threaded for a Class 3 fit. Use S. M. B. Nuts and Washers with S. M. B. Bolts for firm, delicate adjustments. They hold work in exact position for heaviest machine cuts.

BOYAR-SCHULTZ

COPPER HEAD LAPS...

Economy and accuracy are the outstanding features of Copper Head Laps. They work rapidly. Only the replaceable copper sleeves wear out. Sleeve adjustment permits maintaining correct lapping size till worn out when it is replaced with a new one. Save costly tool room time. Available from stock in standard sizes, $\frac{1}{8}$" to $2\frac{1}{2}$" Diameters.

BOYAR-SCHULTZ CORPORATION



it

isn't

just

Luck

Luck doesn't make a winner... It isn't just luck that finds COULTER MACHINES successfully at work all over the world. It's the perfect combination of more than half a century of "on-the-job" experience, plus competent personnel that know threading equipment problems, and how to solve them.

COULTER has "been-in-there" since 1896.

★ Thread Miller: For long and short threaded parts, internal, and external threads. Multiple and single cutter types.

★ Threading Lathe: For long threaded parts by the chaser method.

the James COULTER Machine Co. BRIDGEPORT, CONN.

We welcome your inquiries.

Improve Product *Quality* Without Re-tooling

Sturtevant Sensory TORQUE WRENCH -HEAR-FEEL-SEE-

Without changing design, re-tooling, changing materials or incurring major expense or delay, many manufacturers are improving the quality and performance of their products—are eliminating chatter, binding, loosening, leakage, thread stripping etc.—by torquing all nuts, bolts, screws and threaded parts.

With STURTEVANT Permanently Accurate Torque Wrenches you can *assemble* to close tolerances of torque, can avoid over stressing and damaging strains. As easy to use as an ordinary socket wrench, Sturtevant Sensory (High Speed Production) Wrenches *save assembly time* while *improving product quality.*

Write for Bulletin SWS

PA STURTEVANT CO. ADDISON QUALITY ILLINOIS

GEAR PRODUCTION HIGHLIGHTS

No. 103

Cutting-Shaving-Checking-Lapping

MICHIGAN TOOL COMPANY
7171 E. McNICHOLS RD. • DETROIT 12, MICH.

15 to 1 Output Ratio on Shear-Speed vs. Hobber

A single Michigan Tool Shear-Speed gear shaper is currently turning out 130 five-pitch, 15-tooth, 3-inch diameter, ½-inch face gears per hour, approximately 15 times the production formerly obtained on the same part on a hobbing machine.

To obtain this production, all the teeth on four blanks are cut simultaneously, compared with six blanks cut on one arbor on the former hobbing machine setup.

Tool life is reported highly satisfactory with some 1200 parts being produced per grind. Since .010 to .012 inch is removed in sharpening the form tools, about 40 resharpenings are possible, for a total output of 48,000 gears per set of tools.

Fig. 1 shows the machine just after finishing a load of four blanks in around one minute cutting time. The operator is about to remove the finished gears. Fig. 2 shows four finished gears, four of the blanks from which they are cut, a Shear-Speed tool head as it looks from below, and one of the single point form tools used in the head.

To change tools, the head is lowered slightly, the tools are slipped out, and another set is inserted. Tools are sharpened by grinding the top face to master gage height on a surface grinder.

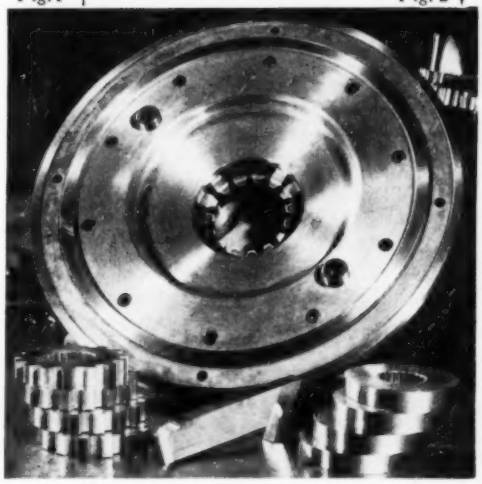
Practice is to remove a set of tools each day, or after each 1200 pieces, for sharpening. Theoretically, somewhat longer tool life per sharpening could be obtained. However, this would call for removing tools for grinding at irregular periods.

Material of the gear is SAE 1115, heat-treated after cutting. The part is used as a ratchet lock for a handbrake inside an automobile transmission.

For Shear-Speed machine details, write Michigan Tool Company for Bulletin SS-48-3.

Fig. 1 ↑

Fig. 2 ↓



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for precision work

Arch Sub-Press

Provision is made for compensation for wear, so that the original alignment is maintained. This is especially important for producing precision or complicated parts. The long bearing surface also tends to increase precision and durability. Arch Sub-presses are designed for strip work. The Overhang type, with its better access and visibility, should be used for subsequent operations requiring hand positioning of the work.

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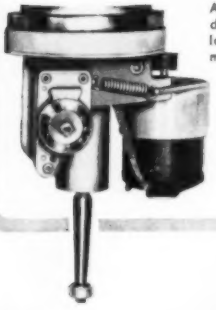
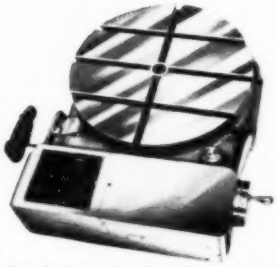


Accurately and quickly finishes holes and bores up to 6" diameter in hardened parts. Simplifies handling work too large to swing in standard machines. Special adaptors permit easy installation on any milling machine.



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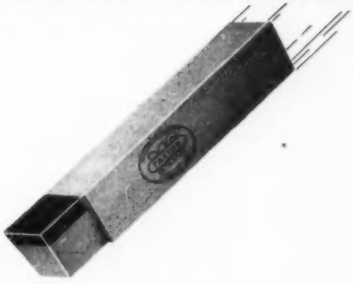

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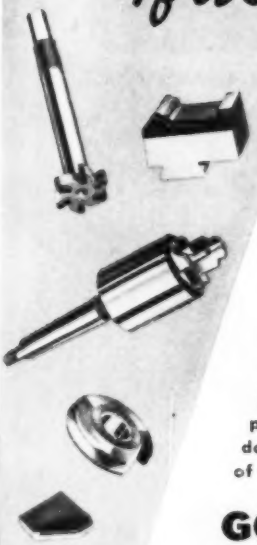

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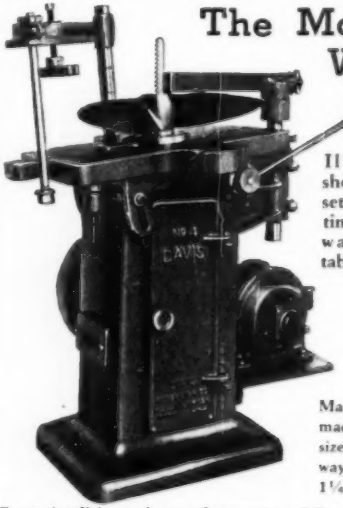

Illustration shows typical set-up for cutting taper keyways with table tilted.

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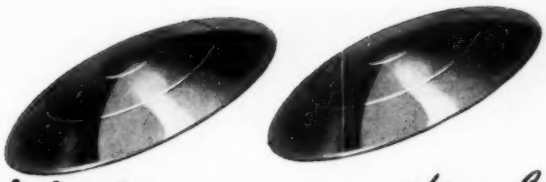

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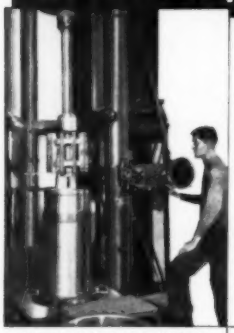

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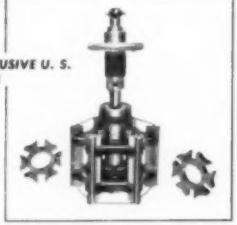

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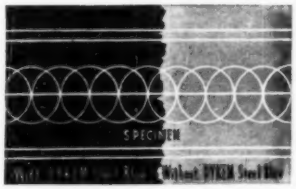

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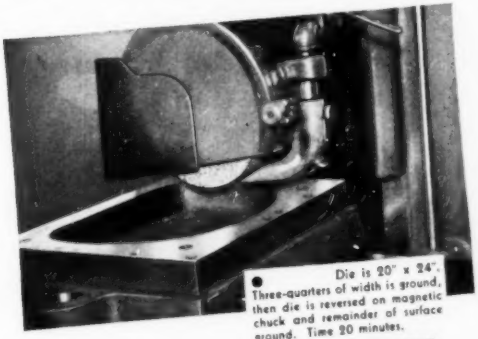
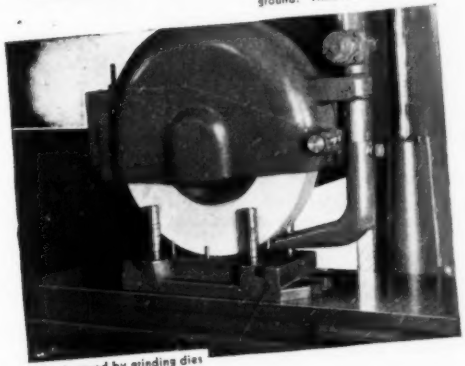
A few examples of die jobs ground on the Mattison at a considerable saving in time, are shown on this page. Die shown in the lower left hand corner was ground with leader pins in place at 1/3 of former time. Wheel and spindle clearance of Mattison Grinder is sufficient to handle this type of work with ease, eliminating time required for disassembly and alignment when leader pins are removed.

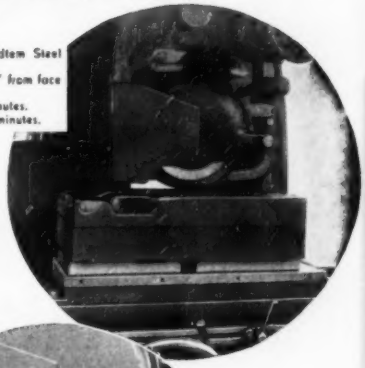
• For further data regarding use of Mattison Grinders for reconditioning dies, ask us to send you free set-up book on this subject.



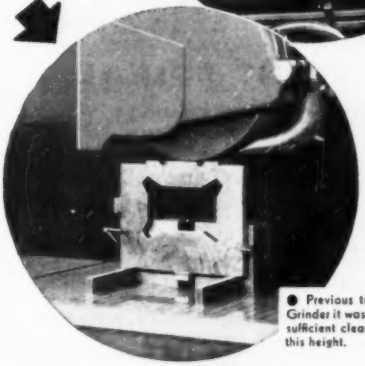
● Die is 20" x 24". Three-quarters of width is ground, then die is reversed on magnetic chuck and remainder of surface ground. Time 20 minutes.



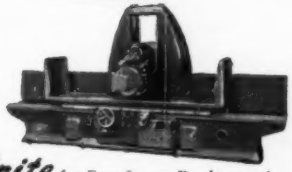
Time is saved by grinding dies with leader pins in place.



● Material: Hardtem Steel Forging die.
Stock Removed: 1/16" from face side.
Present Time: 8 minutes.
Previous Time: 30 minutes.



● Previous to obtaining Mattison Grinder it was not possible to obtain sufficient clearance to grind dies of this height.



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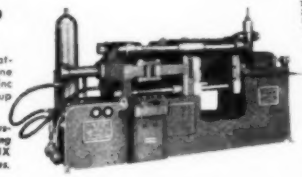

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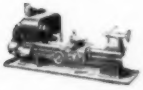

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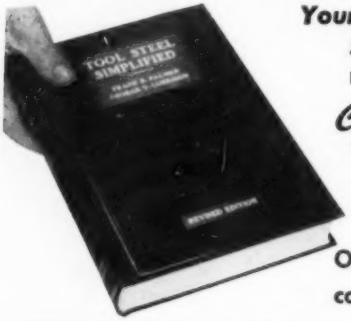

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10. Heat Treating Methods and Equipment
11. Hardness and Toughness Testing
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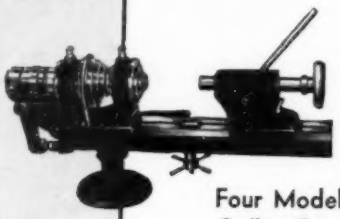

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1800 Industrial Trust Bldg., Providence, R. I.
Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

Name .....
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Address .....

Why "throw away" HALF the potential production of your taps?

Learn how you can increase the life and accuracy of your taps by writing today for Bulletin 466A

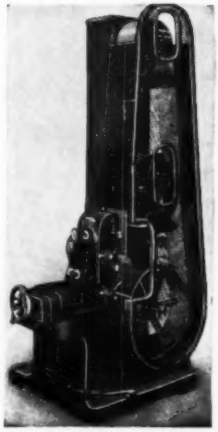
EDWARD Blake COMPANY

437 CHERRY STREET
WEST NEWTON 65
MASSACHUSETTS

HIGH QUALITY FINISHING, even with unskilled labor, is assured on the TYPE A "PRODUCTION" Centerless Feed POLISHING MACHINE . . .

Round bars and tubes up to 6 inch diameter may be done on this machine — A high grade finish is easily obtained on metals, plastics, fibre, and many other materials at a high rate of production—Our patented two belt system assuring proper chip clearance accounts for the outstanding results attained with this machine—Tapered work can also be handled by means of our patented Taper Feed Attachment.

See results on your own product —send us samples of your work —a full report will be submitted without obligation!



Write for descriptive Bulletin AM-9 giving full specifications.

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER on Your Work

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

WRITE today for Catalog No. 16

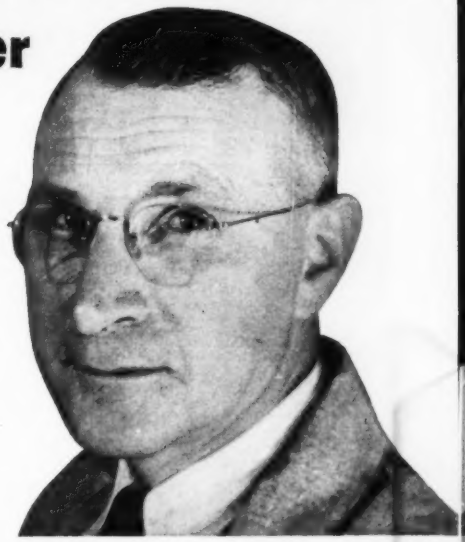
NATIONAL MACHINE TOOL CO.
CINCINNATI 22, OHIO

Bench Leader demonstrates new Lufkin "CHROME CLAD" Micrometer

with Non-Glare Satin Finish

•

E. J. Samel, veteran of the Packard Motor Car Company tool room, approves its easy-reading, rust and wear resistant features.



● Its satin finish absorbs light, prevents glare and eyestrain. Markings stand out sharp in any light. It is rust and wear resistant. Hardened ground thread, one-piece spindle, ease of adjustment and "rapid reading" (each thousandth numbered) are a few of the many desirable features of this great improved tool. Here's a real ally for the precision worker to whom accuracy is a must.

Designed to make accurate measurements easy for the operator. Heavy chrome plating with non-glare satin finish brings out markings sharply without eyestrain. You get readings at a glance in bright or poor light.

"See how throat depth and cutaway frame make entry possible in minimum clearance and enable easy measuring to maximum depth in narrow slots."

"It is well-balanced. Ratchet stop eliminates overpressure, gives more consistently accurate measurements —important when your 'feel' is off."

"Look—you can take it apart completely, even clean inside of thimble and thread. And the reading line keeps its original position permanently—directly in line of vision after adjusting for wear or lapping of anvil and spindle faces."

Seven Superior Features

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"Chrome Clad", Non-Glare Satin Finish

•

Hardened Ground Thread

•

One-Piece Spindle

•

Micro-Lap, Mirror-Like Finish on Anvil and Spindle Ends

•

Cutaway Frame

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Easy Adjustment

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"Rapid Reading"

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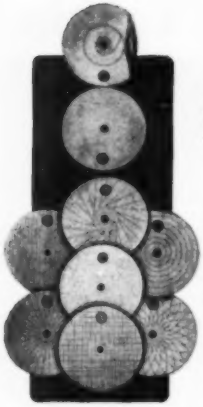

*Hanson-Van Winkle-Munning has supplied the plating industry for over 70 years. Our sales-engineers are thoroughly familiar with every step in the process of electroplating and polishing. It is this *overall* knowledge that has made H-VW-M "Headquarters" for electroplating and polishing equipment, supplies and technical assistance.

"What's so good about H-VW-M BUFFS?"

RALPH R. GRANQUIST · District Manager · H-VW-M Chicago Office

THAT'S a question customers frequently ask when I call to talk about H-VW-M electroplating and polishing equipment. My answer is this:

"H-VW-M has been making and testing buffs of all types for more than 60 years. That means H-VW-M knows buff textiles, knows what grades serve best for composition conveyance, minimum raveling and abrasive wear—knows fabricating techniques thoroughly. But what's important, H-VW-M applies this knowledge to each buff it turns out.

"So, whether you specify Full Disc, Triplex or Pieced, you get the right buff for long wear and efficient service every time. In addition to a wide variety of job-designed sewings, all H-VW-M buffs are finished with our Red-E-to-Use face assuring perfect balance and requiring no initial raking.

"I like to tell my customers about H-VW-M's service too, which offers complete facilities for the study of buffing problems, resulting in dollar-saving solutions. Before leaving my customer, I always give him Bulletin BC-104. It's chock full of information on buffs. Ask your salesman for a copy or write to 'Headquarters.'"

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MATAWAN, NEW JERSEY

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Patents Pending

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The Sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

BUSHINGS MADE IN FOLLOWING SIZES:
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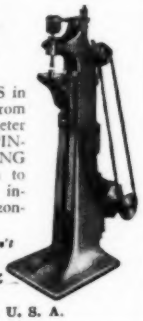

THE GRANT MFG. & MACHINE CO.
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TALK about your *free-cutting* brass rod! In Chase regular Free-Cutting Brass Rod the number of lead particles removed in *one* revolution of a ¼" drill is about 9,000,000!

Each of these particles is contributing to this free-cutting quality. That's what speeds your production... preserves your machinery... produces a finer product. And Chase regularly produces 19 different highest quality copper-alloy rods for your needs.

It's to your advantage to *buy brass rod from a brass manufacturer.* Your problems are our problems. It is our business to offer you the best possible service — including free advice on special problems and alloys—and we have the *largest network* of brass and copper warehouses and offices in the country *ready to serve you.*

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THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

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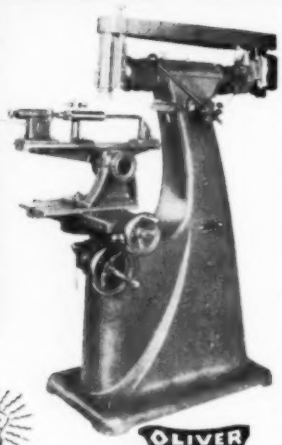
. . . For Sharpening . . .
Perishable Cutting Tools"

THE OLIVER ACE CUTTER GRINDER



Yes, this is what a prominent Manufacturer and user of 5 Oliver ACE Grinders says. In full, his comment reads:

"The last word in machines for sharpening all types of milling cutters, boring tools, flat broaches, and many other types of perishable cutting tools. We cannot speak too highly for this machine."

When you provide fast, accurate grinding of expensive tools, you prolong their life—save on down time—save on labor and secure better production results. (And you get, as Oliver has, warm response from users all over the industrial world.)

If you are sharpening cutters by expensive, semi-accurate means, we urge you to write today for our ACE Catalog, fully describing Standard (shown above) and Heavy Duty (for Tungsten-Carbide and other hard metal cutters). No charge, of course.

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17 standard models.

Exclusive
SENSITIVE PRESSURE CONTROL
RAM AT TOP POSITION
APPROACH STROKE AT NO PRESSURE
RAM PRESSURE INCREASES WITH LEVER OR PEDAL MOVEMENT

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...SUPER-SPACER

This fixture allows rigid control of accurate machining operations within its scope at speeds and feeds limited only by the capacity of the holding means and the power of the machine.

Standard mask plates have 2, 3, 4, 6, 8, or 12 divisions. Specials made to order. All Super-Spacers come complete with mask plates, Universal chuck and chuck wrench. Write for Bulletin S-101.

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Only ERRINGTON Adjustable TAPPING HEAD

Offers So Many Advantages

Sizes: #0 - #10 Tap to 5/16"
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No. Spindles: 2 to 6

Here's a versatile tool which permits you to take advantage of a wide range of adjustment — without overhang. Supplied with 3 spindles for equal adjustment in line and 3, 4, 5 or 6 spindles for equal adjustment on bolt circles.

- Fully geared
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Can be supplied with sliding head and table; also on a stand with throat 3" deep.

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Makers *Waltham 54, Mass.*

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A SURFACE GRINDER LIKE THIS

The most important Surface Grinder development in years!

LEACH 6x12 SURFACE GRINDER

ONLY

$485.00

COMPLETE WITH MOTOR **F. O. B. PROVIDENCE, R. I., U. S. A.**

Look at that low price, then consider these facts carefully: The Leach 6 x 12 Surface Grinder actually handles 90% — yes, 90% — of the work of larger, far more expensive machines. It's a completely self-contained unit with a 2-speed ball bearing spindle, driven by a ¾ HP motor. It's accurate, time-saving, vibrationless, and proved to the hilt by hundreds of enthusiastic owners. Write to us for detailed description.

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MULTIPLE SPINDLE CONTINUOUS DRILLERS

Davis and Thompson Roto-Matic

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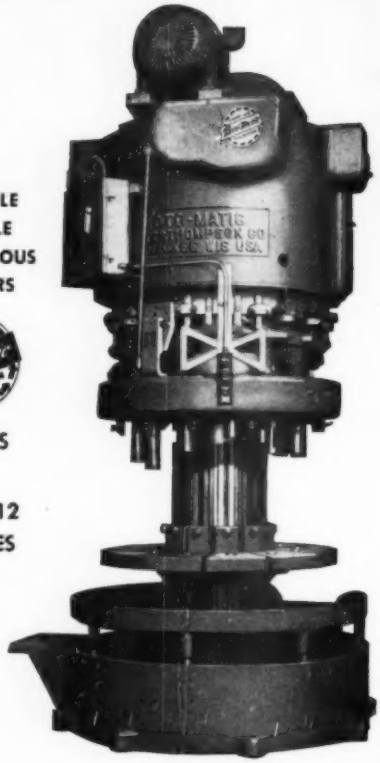
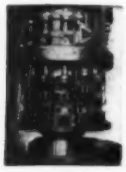
6-8 OR 12 SPINDLES

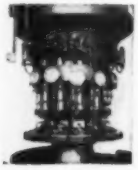


One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.



2 SPINDLE DRILL HEADS



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AUTOMATIC CLAMPING

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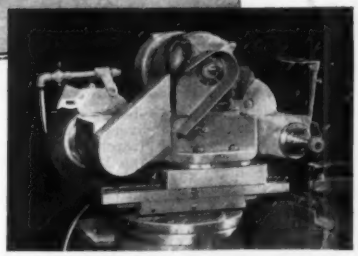
Cut "set-up" time
Slash toolroom grinding costs

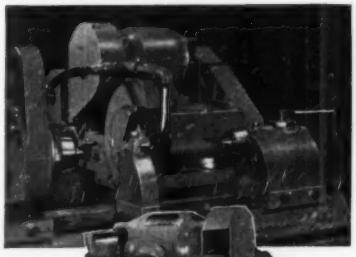
with the *New* RIVETT 1024 TOOLROOM GRINDER

At long last! — a toolroom grinder that *does* something about "set-up" costs, far and away the most expensive item in toolroom and small lot grinding. On internal and external grinding work on straight, taper, two-angle, face and shoulder surfaces, Rivett 1024 has these *new* features to help you cut "set-up" time drastically:

1. **Double-end wheelhead** — Exclusive! Two spindles on swiveling workhead make possible rapid changes to internal or to external work. 2. **Hydraulic table reciprocation** — infinitely adjustable for speed and length of travel. 3. **Graduated swivel table and sine bar on workhead** — assure accurately measured tapers and angles. 4. **Optional work holding methods** — uses collets, step chucks, jaw chucks, plates, fixtures or "on-centers." 5. **Adjustable spindle speed** — internal from 6,000 to 35,000 r.p.m.; external 1800 or 2100 r.p.m.



New! **Double-end wheelhead carries both internal and external spindles . . . swivels 180° to position *either* spindle. *Found only on the new Rivett 1024!***



And that's not all — the Rivett 1024 Grinder has been specially designed to extend the *range* of your grinding operations . . . double slides and swivels on cross slide increase possible "set-ups" *including double angles at one grind* . . . external wheel can be mounted on either end of spindle to permit face and shoulder grinding using periphery of wheel . . . positive table stop with micrometer adjustment positions work.

CUT COSTS ON TOOLROOM GRINDING

Bulletin 1024 tells the whole story in pictures and helpful technical information. Write for your copy today.

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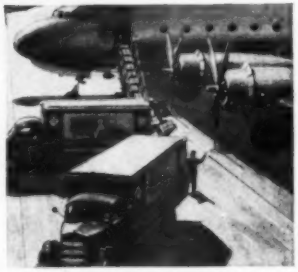

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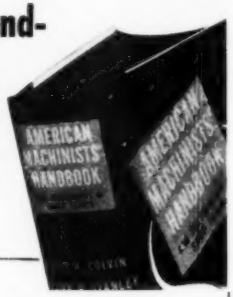

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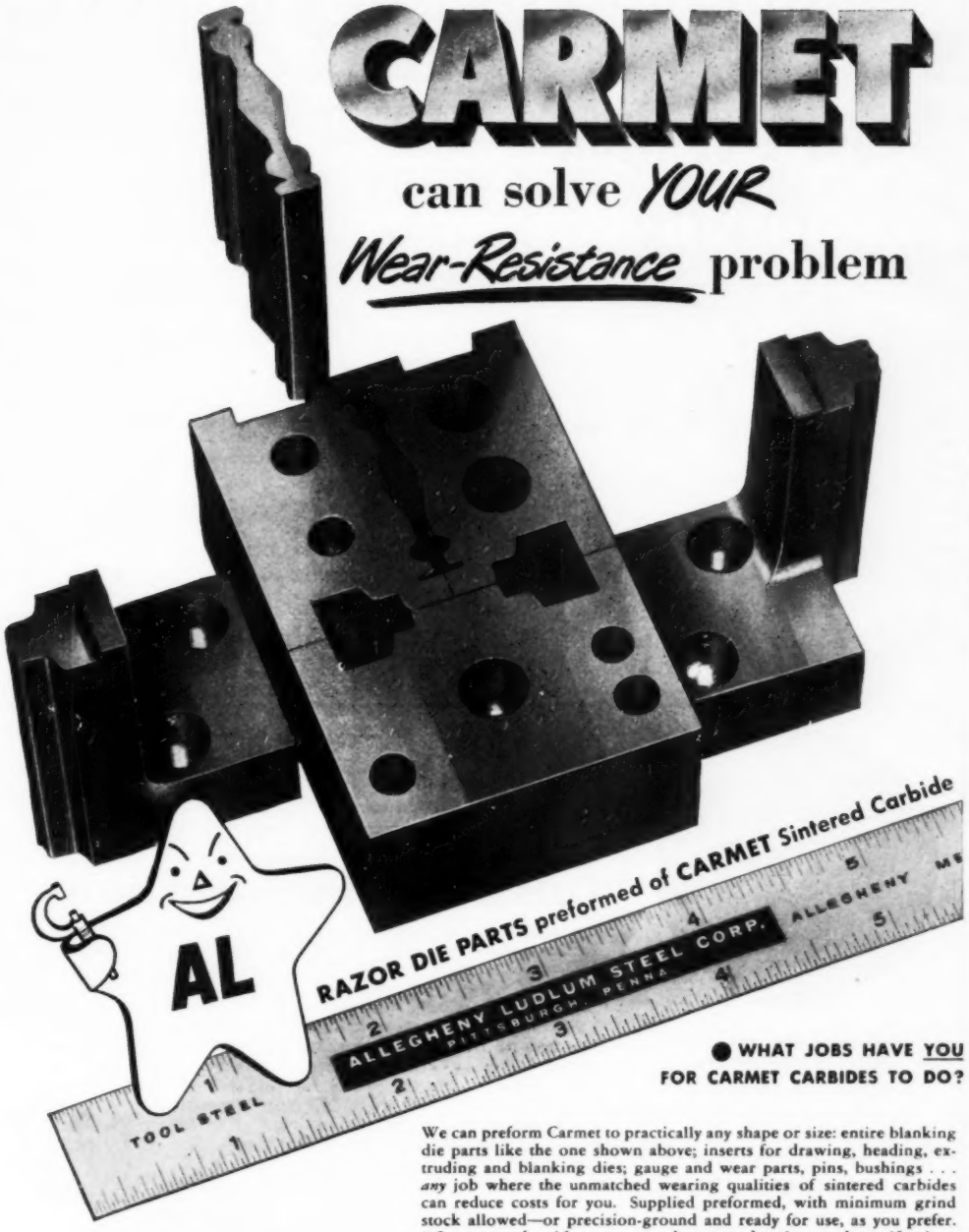

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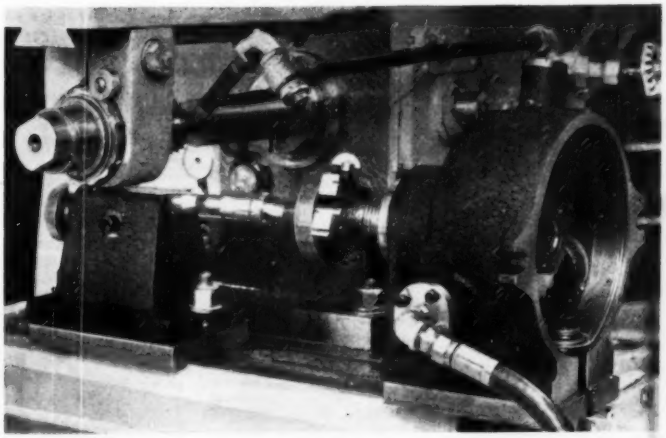

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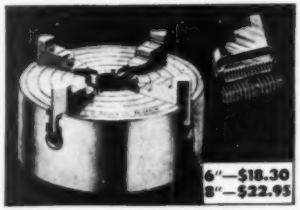

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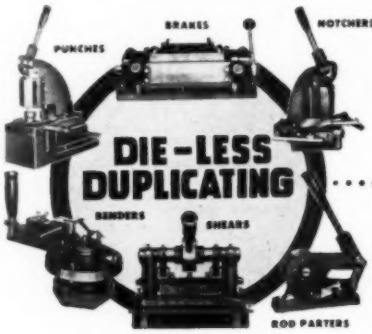

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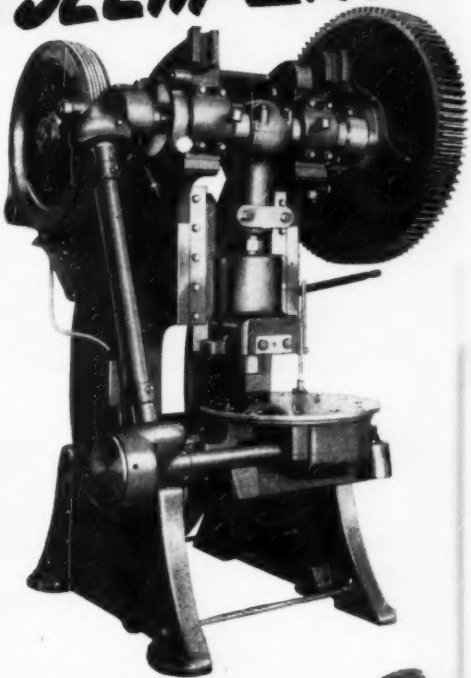

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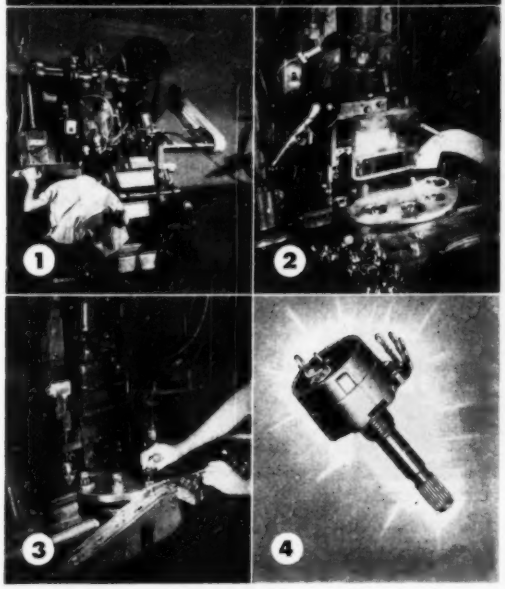

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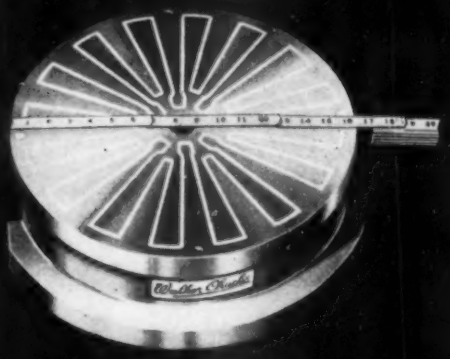

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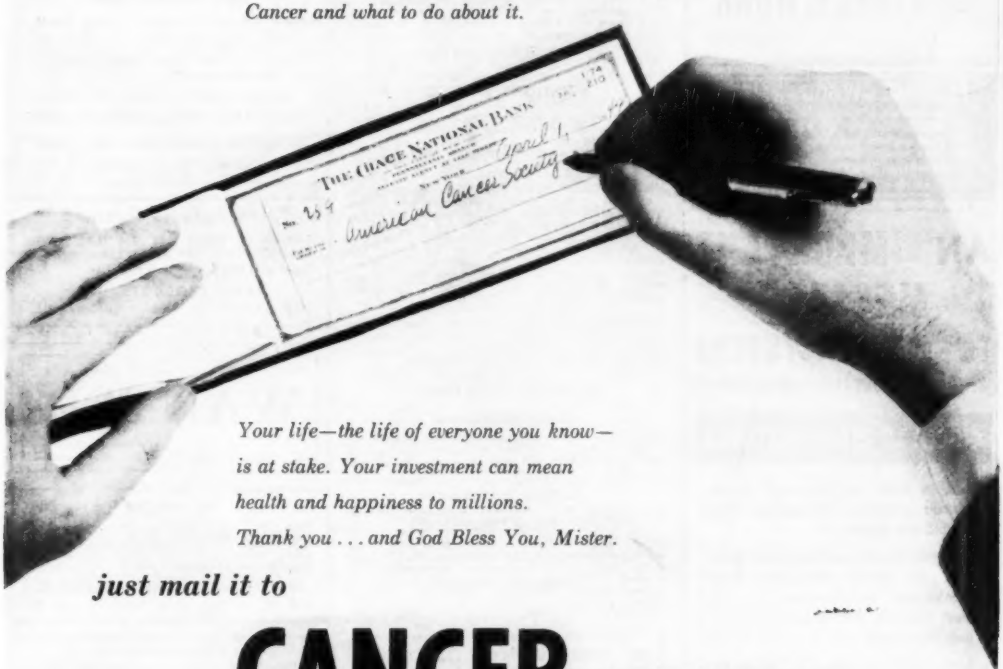

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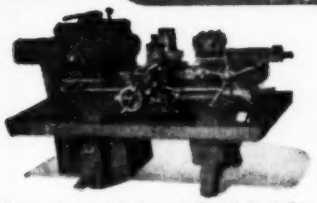

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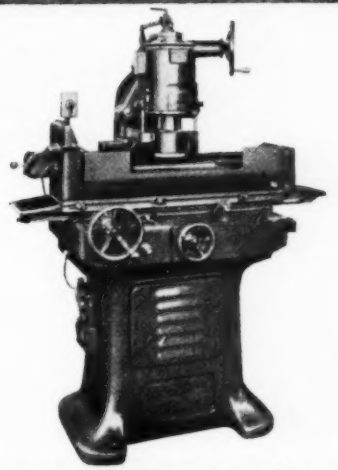
20"x10' Hendey Motorized.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x8' Davis O.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8 Hendey Q.C.G. 49" centers
18"x6' American, Geared Head, M.D.
16"x12' South Bend Q.C.G. Enclosed Head Underdriven with 1½ h.p. motor & controls. 105½" centers. NEW—1946. Has chuck, turret tool post, 2-steady rests, faceplates. Excellent condition. Immediate delivery from stock.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head
16"x6' Lodge & Shipley "Patent Head", Motor Dr.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachment, Chucks, Collets & Quick Acting Collet Chuck.
14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48". Completely rebuilt. Immediate shipment.



Norton 6x18 Vertical Rotary Automatic Surface Grinders. 220/440 volts motors. Excello Spindles. Hydraulic Table feeds. Three Available with immediate delivery.

GRINDING MACHINES

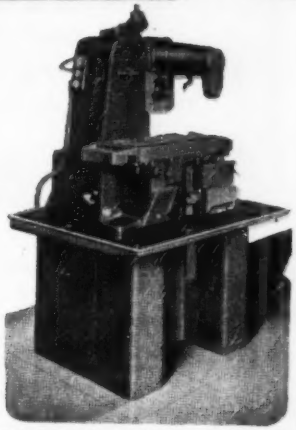
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical
Oliver of Adrian #51 Drill Grinders
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto. downfeed to head. Motor driven exhauster unit.
NEW—Leach 6x12 Horiz. Surface. 220 volts motor, ball-bearing Spdle. Permanent magnetic chuck. Immediate shipment from stock.
Norton 6x36 Horiz. Surface. 220/440 volts motor. Has extra grinding wheels and 40x9 chuck. For wet & dry work. Excellent condition.

AUTOMATICS

#0G & #00 Brown & Sharpe Automatic.
#2G Brown & Sharpe High Speed Automatic Screw Machine. Serial #6814. Self-contained 5 h.p. 3/60/220/440 volts motor drive & controls. Complete coolant, toolposts, gears, collets. FOUR AVAILABLE.
#2 Brown & Sharpe Automatic. Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system, change gears. FOUR AVAILABLE.
Cleveland Model "A" 3¾" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system.

PUNCH PRESSES

Niles Bement & Pond Horiz. Hydraulic Wheel Press. 200 tons capacity. 48" between strain bars.
Bliss #18, #20, #208, #21 O.B.I. Motorized.
Ferracute #86 Wide Frame, motor driven. 61½" between housings. 13¾" stroke.
Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Lucas 15 tons, Power Arbor Press. M. Dr.
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. All sizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Toledo #5 O.B.I. 44 tons capacity.
Federal #3 O.B.I. 26 tons capacity.



Cincinnati #0-8 Automatic Horizontal Motor Driven Milling Machines. Some with Rise & Fall Mechanism. FIVE AVAILABLE.

MILLING MACHINES

Nichols Hand, Late Type, M.D. (six)
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Becker #5C Vertical, Cone Dr.
Knight #1½ C Vertical
Cincinnati #3 & #4 Vertical. Dial Type
Cincinnati #3, #4, #5 Pl. Horiz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr. Dial Type
Milwaukee #3K Vertical, M. Dr. Dial Type
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
Cincinnati #0-8 Vertical. Motor driven. (EIGHT AVAILABLE)

UNIVERSAL MILLING MACHINES

Ames Bench, 12"x3"x7½"
Index #40H, 16"x8½"x16"
B & S #2, 20"x5"x17½"
B & S #1½, 20"x7"x18"
Bridgeport, 20"x9"x16"
B & S #1D, 24"x8"x15"
Garvin #2MU, 24"x8"x18"
K & T "Milwaukee" #2, 28"x10"x17"
Kempsmith #2, 28"x8½"x18"
Cincinnati #2, 28"x10"x18"
Cincinnati #2M, 28"x10"x18"
B & S #3, 34"x10"x21"
Cincinnati #3S, 34"x12"x20"
Some w/index heads & equipment

SHAPERS

Shaper—Columbia 32" B.G. Crank, motorized Power downfeed to head.
Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
NEW—Gemco 20" Universal Shaper, M. Dr.
Shaper—American 24" crank, motorized
Planer—Shaper—Niles-B. Pond 20x20x24

DRILLING MACHINES

Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
Fosdick 5" Arm 14" col. Radial
American 4' Triple Purpose Radial, M. Dr.
Cinci-Bickford 3' Arm, 9" Col. Radial. Motor driven. W/table. 12 Speed gearbox.

SIMMONS ENGINEERED Machine Tool REBUILDING NEWS

SIMMONS MACHINE TOOL CORPORATION • MAIN OFFICE AND PLANT, 1759 N. BROADWAY, ALBANY, N. Y.

Late-Type Boring, Milling & Threading Machines

Two excellent Late Type Horizontal Boring, Milling and Threading Machines with auxiliary high speed spindles.

5" Spindle NILES "Timesaver" Horizontal Table Type Boring, Milling and Threading Machines. With 2⅝" high speed spindles. Forced feed lubrication, all geared feeds and speeds. Power rapid traverse throughout.

SPECIFICATIONS

ITEM #8577		ITEM #8578	
Table work surface	60"x96"	Table work surface	60"x96"
Table cross travel	84"	Table cross travel	84"
Table longitudinal travel	92"	Table longitudinal travel	36"
Saddle travel on column	72"	Saddle travel on column	60"
Spindle nose to outboard bearing	144"	Spindle nose to outboard bearing	96"
5" spindle speeds 18, RPM	6 to 240	5" spindle speeds 18, RPM	5 to 210
2⅝" spindle speeds, RPM	24 to 1060	2⅝" spindle speeds, RPM	20 to 840

NEW YORK CITY OFFICE: 50 EAST 42nd STREET

NEW SURPLUS

HIGH SPEED TAPS

$.60 each or

$7.00 per dozen

SIZES

3/48, 1/56, 4/36, 4/40, 4/48, 5/40, 5/44, 6/32, 6/40, 8/32, 8/36, 10/24, 10/32, 12/24, 12/28, 14/20, 14/24.

1/4"-20, 1/4"-28, 5/16"-18, 5/16"-24, 3/8"-16, 3/8"-24, 7/16"-14, 7/16"-20.

VICTOR MACHINERY EXCHANGE, INC.

251 CENTRE STREET
NEW YORK 13, N. Y.
CANAL 6-5575

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new); plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11, Planer type 16"x36", Surface 13"x63", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—10"x8', 8', 10'—18"x6', 8', 10'—20"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized.
Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—2"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 5¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" HI Duty 2" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16" bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88, Columbus 16, Ohio

LATE DIE SHOP TOOLS

28-60 Cinci. Hydrotel, one spin., 1943
BL 2416 Keller 3 spin. Duplicator, table 22"x42", 3 dimensional
Model 9J Gorton Electric Duplicator, 3 dimensional
Model 9J Gorton Vert. Miller, power feed to head
Bridgeport Vert. Miller, power feed, shaping attach.
(2) Bridgeport Vert. Millers
Indexing Vert. Miller
#3K K. & T. Plain Miller, with vert. attach. & Rotary table
3'9" col. American Hole Wizard Radial
#45 G. & L. Surface Grinder, 12"x24"
16" G. & E. Tool Room Shaper, 1943
#2 B. & S. Surface Grinder, 1943
Cinci. Monoset Grinder
(2) 9" Hardinge Bench Lathes
24" Foote-Burt Drill, #2 M.T.

BENNETT MACHINERY CO.

30 Church St., New York 7, N. Y.

LATHES FOR SALE

JONES & LAMSON "FAY" 20"x25" Auto. Latest
LODGE & SHIPLEY 18"x72" Centers Motor Drive
NILES 30"x50" boring "Time Saver" Latest Type
PUTNAM 42"x25" centers Geared Motor Drive
REED PRENTICE 16"x48" Centers MD
SCHUMACHER & BOYE 24x158" Centers geared MD

HARRISON MACHINERY EXCHANGE INC.
South 4th St. Harrison, N. J.
Tel.: HUMBOLDT 2-5750, 2-5775

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
MONA

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

EMERMAN *Offers from* STOCK

PLANER TYPE MILLS

DAVIS AND THOMPSON PLANER TYPE MILLING MACHINE

Capacity 54" x 60" x 10'

Table 57" x 120"

Spindle has 18" Quill Feed
Diameter of Quill 15"

Cutter Spindle 10¾" in Diameter

Mounted on Double Roller Bearings, both front and rear. Complete with all Electrical Equipment.

Weight Approx. 75,000 lbs.

36" SERIES CINCINNATI — HORIZONTAL HYDRO-TEL

Table Working Surface 36" x 93". Spindle Speeds (16) 12—720 RPM.
Max. Spindle Nose to Table 48".

48" x 48" x 10' INGERSOLL OPENSIDE VERTICAL MILLING & BORING MACHINE

Table Working Surface 48" x 10'. Wt. Approx. 50,000 lbs.

ADDITIONAL INGERSOLLS

72" x 64" x 14' Ingersoll Planer Type Heads (Right Angle Milling Head).
30" x 24" x 14' Ingersoll 2 Heads. 24" x 24" x 12' Ingersoll 3 Heads.

EMERMAN MACHINERY CORP.

875 W. 120TH STREET • CHICAGO 43, ILLINOIS

EASTERN OFFERS FROM STOCK

ENGINE LATHES

10x20" centers Monarch EE Geared Head, m.d., latest
10x24" Logan, cone, motorized
13x30" centers Geared & Whitney Model B, m.d., taper
13x48" centers Pratt & Whitney Model D, m.d.
14x30" centers Lodge & Shipley Selec. Head, m.d., latest
14x54" centers Bradford Geared Head, m.d., taper
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
15"x6' LeBlond Geared Head, m.d.
16"x14' American Geared Head, m.d.
16"x36" Pratt & Whitney Geared Head, m.d.
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
16"x10' Hendey Yoke Head, taper
17"x6' LeBlond Geared Head, m.d.
18"x32" centers American Geared Head, m.d., taper
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' Champion, cone
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x10' Cincinati, cone
18"x10' Lodge & Shipley Selec. Head, m.d.
19"x8' bed LeBlond Geared Head, m.d., taper
19"x10' LeBlond Geared Head, m.d.
20"x8' American Geared Head, m.d., taper
20"x8' Cisco, cone
20"x10' Sidney Geared Head, m.d.
20"x11' Lehmann Geared Head, m.d., taper
21"x12' Bradford, cone
21"x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d., taper
24"x12' LeBlond, cone
24"x12' Monarch Geared Head, m.d., taper
24"x40' bed American Geared Head, m.d.
25"x10' LeBlond, cone
26"x8' Bridgeford Geared Head, m.d.
26"x12' Bridgeford Geared Head, m.d., taper
27"x18' LeBlond Geared Head, m.d., p.r.t., hardened ways
27"x48" centers Monarch Geared Head, m.d.
20"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d.
36" raised to swing 56"x20' American Geared Head, m.d., taper, Timken
32"x12' Lehmann Hydratrol Geared Head, m.d., taper, latest
36"x32" centers Putnam Geared Head, m.d.
36"x36'6" Niles Heavy Duty, m.d., latest, 2 carriages
50"x204" centers LeBlond Geared Head, m.d., taper, latest

MANUFACTURING TYPE MILLING MACHINES

No. 00 Sundstrand Hydraulic Rigidmill, m.d., latest
No. 0-S Cincinnati Model EA, m.d., latest
No. 12 Brown & Sharpe, m.d.
No. 1-12 Cincinnati, m.d., latest
No. 1-18 Cincinnati, m.d., latest
No. 2 Sundstrand Electromill, m.d., latest
No. 2-16 Cincinnati, m.d., latest
No. 2-18 Cincinnati, m.d., with rise & fall, latest
No. 2-24 Cincinnati, m.d., latest
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 4-48 Cincinnati Duplex Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, with tracer control, latest
No. 34-36 Cincinnati Plain Hydromatic, m.d., with tracer control, latest
No. 36-72 Cincinnati Duplex Hydromatic, m.d., latest
No. 56-90 Cincinnati Duplex Hydromatic, m.d., latest
Type P Ohio Mfg., m.d.
Sundstrand Rigidmill, m.d.
4" Pratt & Whitney Spline, m.d.
No. 33 Kempsmith Mfg., s.p.d.
18", 24" Cincinnati Plain Automatic, m.d.
24", 48" Cincinnati Duplex Automatic, m.d.
30"x36"x12' Ingersoll Slab, 2 heads, m.d.
72"x6' Ingersoll Single Horizontal Spindle Traveling Housing Milling Machine, m.d.
96"x22' Ingersoll, as above

THREAD MILLING MACHINES

No. CT-36 Lees-Bradner, m.d., latest
No. CT-54 Lees-Bradner, m.d., latest
Hall Planetary, m.d.
4½"x12", 6x14", 6x48", 6x80" Pratt & Whitney
10x24" Hanson Whitney, m.d., latest

TURRET LATHES and SCREW MACHINES

No. 1H6 Libby, m.d., chucking, latest
No. 1 Cincinnati Acme Semi-Universal, m.d., chucking, Timken
No. 1L Gisholt Universal, m.d., chucking, Timken
No. 1A, 2A, 3A Warner & Swasey Universal, bar and chucking types
No. 2A, 3A Warner & Swasey Universal, chucking, Timken
No. 1A Warner & Swasey Universal, chucking, preselector head, latest
No. 2B Foster Universal, m.d., chucking
No. 2F Gisholt Fastermatic, m.d., latest type
No. 2G Morey, bar, m.d., latest
No. 2L Gisholt, m.d., chucking, standard and long bed types, Timken
No. 3 Cinni, Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3B Foster Universal, m.d. bar
No. 3L Gisholt, m.d., chucking, Timken
No. 3L Gisholt, with cross sliding Turret
No. 3 Warner & Swasey Universal, m.d., bar, latest
No. 3 & 3A Warner & Swasey Universal, m.d., chucking, latest
No. 4R Cincinnati Acme, m.d., bar
No. 4 Gisholt Universal, m.d., chucking, Timken
No. 4 W. & S., Plain, cone, bar and chucking types
No. 4 Warner & Swasey Universal, bar, m.d.
No. 4 Warner & Swasey Universal, bar, m.d., preselector head, latest
No. 4 Warner & Swasey Universal, chucking, as above
No. 4A W. & S. Universal, m.d., chucking, latest type

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Let us quote on your requirements.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241
CABLE ADDRESS EMCO

AUTOMATICS

9, 10", 1", 1¼", 1⅝", 2", 2¼", 2⅝" Acme Gridleys, late
#0G B & S, late type
1½" & 1⅝" B Spdl. Cone, late
2¼ & 2⅝" Cone 6 Spdl., late
12" and 16" B Spdl. Bullard Multaumatics, late

PRESSES

2800 ton Bliss Hydr., 3 col. type, 12" str., 50½" sht. ht., dia. bed 115"
60 ton Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel
90 ton Dbl. Crank, 8" stroke, 48x18 bed, late model Bliss
35 ton 4, 8, 6" stroke, latest type, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke 21 x 27 bed, 110 strokes per min., Bliss, latest type
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late type
Inclinable, New, 20 to 70 ton, immediate delivery
375 ton Elmes, 12" stroke, 84x54 bed, late type
350 ton Elmes, 20" stroke, 36x45 bed, late type
250 & 750 Baldwin, 144x48 bed, 40" stroke
#30S Bliss, 12" stroke, late

TURRET LATHES

#3 & #5 Warner & Swasey, late type w/Tools
#4FU Fastermatic, 4" cap., late type
#3H8 Libby Sliding Bed Gap, 8¼" cap., late type 72" swing, 30 H.P. Mtr.

MONA MEMBER
PAULS MACHINERY COMPANY
6111 Vermont Ave. — Detroit 8, Mich.
Phone: TYLER 7-6300

Nos. 19 & 21 Bliss Presses.
Nos. 0G & 2G B & S High Speed Automatics.
Covel Model JBPT Drill Grinder, 1945.
Davis 12"x6' Gap Lathe.

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

GUARANTEED TOOLS

16"x54" LE BLOND Toolroom Lathe, 1943
20"x10' AMERICAN High Duty 12 Speed Timken Head, taper attachment, M.D.
24"x10' LODGE & SHIPLEY, 12 Speed Geared Head Engine Lathe, taper attachment
24"—36"—42" BULLARD V.T.L.
42"x96" AMERICAN 16 Speed G. H. Engine Lathe
48"x28' DRIGGS (NEW HAVEN) G. H. Lathe
No. 3 BARDONS & OLIVER Turret Lathe
No. 4 GISHOLT Turret Lathe, bar feed
No. 1224 KEARNEY & TRECKER Simplex
42"x42"x12' INGERSOLL Adjustable Rail Planer Type Mill, 4 heads, 25 HP motor
24" GOULD & EBERHARDT "Industrial," 1940
32" OHIO Heavy Duty Shaper, 1942
Type BGI-482 KELLER Automatic Toolroom Duplicating Machine, 3 dimensional, 1944
6' CINCINNATI GILBERT Radial, 17" column, motor on arm
No. 5 NEWARK Universal Gear Hobber, 72" cap.
84" CONSOLIDATED COLBURN Vert. Boring Mill Rapid Traverse 2 heads A.C.—M.D.
No. 32 LUCAS Hor. Boring Mill, A.C.—M.D.
No. 7 BARRETT Cylinder Borer 8" Bar

O'CONNELL MACHINERY CO.
1825 NIAGARA ST. BUFFALO 7, N.Y.

National Bent Shank Nut Tappers Battery of 5/8" to 1" Machines.
Waterbury-Farrel Fdry. 5/8" and 1" D.S. S.D. Cold Headers, also Thread Rollers.
Fisher 5" Bar, Floor Type Boring Mill. New in 1942.
Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.
Bliss Presses in all sizes up to 1,000 ton capacity.
Wire Working Machinery.

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

LATE TYPE MACHINE TOOLS

BORING MACHINE
EXCELLO No. 112C

CHECKING MACHINE
SHEFFIELD CORP. Lead Checker BM31

FURNACE
LEEDS NORTHRUP HOMOCARB 25x36"
LINDBERG 2828EH
LINDBERG 1620EH
G. E. Vert. Cyl. Cat. No. 5364773—G.2 45 KW 220 V. 3 phase, 60 cycle, cap. 20"x 36" deep

GEAR MACHINES
FELLOWS No. 72 Gear Shaper
GLEASON No. 4 & 6 Hand Rolling Gear Tester
GLEASON Quenching Press 15"
GLEASON Quenching Press 25"
NAT'L BROACH Gear Shaver 18"
ILLINOIS No. 224 Involute Gear Checker

GRINDERS
LANDIS 10"x24" Univ. Ext. Cyl.
LANDIS 12"x60" Univ. Ext. Cyl.
NORTON 6"x18" Plain Type C Ext. Cyl.
OLIVER No. 510 Drill Pointer

ANDOVER 3-3972
WALTER H. MEYER
Machinery and Equipment Co.
605 W. Washington Blvd., Chicago 6, Ill.

SHEET METAL MACHINERY

NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears, Formings Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

MONA MEMBER
B. D. BROOKS, INC.
361 Atlantic Ave., Boston 10, Mass.

Bor. Mill, Hor. 3" G & L MD, 4½" N-B-P—MD.
Boring Mills, 24"-30"-42"-52"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W and S, S.P.D.
Millers, Plain No. 3 K and T, No. 4 Cin.
Millers, Vertical No. 3 and No. 4 Cin.
Shaper, 16"-20"-24"-36".
Shaper, 36" Morton Draw Cut.
Shears, 42"-60"-72"-132"

West Penn Machinery Company
1210 House Bldg. — Pittsburgh, Pa.

LATE TYPE MACHINERY AT OLD TIME PRICES

AUTOMATICS

Brown & Sharpe #00G, H.S., #4, #6
Conomatic 8 sp. 1⅞" cap.
New Britain Gridley 6I—6 Sp. 2¼"

BORING MILLS

Bullard 42" New Era V.T.L.
Giddings & Lewis #0, #25T
Lucas #3I horiz.
Universal 3" horiz.

DRILLS AND RADIALS

American Hole Wizard 3'-9" col., Amer. 4'-13" col.
Barnes #262, Buffalo 18", 1" capacity
Canedy-Otto 3'-9" col.
Carlton 8'-19" col.
Cinci-Bickford Super Service, 21", 24"
Delta Bench & Floor Models single & 4 spindle
Natco Model E-5 Multi-Spindle, 14 spindles
Royersford Excelsior 21" Back Geared, P.F.
Sibley 24—28", Sliding Head

ENGRAVERS

Gorton #3U, 3Z 2 dimensional; #3L, 3 dimensional
Gorton Cutter Grinders 375-2, 265-5

GEAR EQUIPMENT

Fellows #72, 725 High Speed
Mikron Gear Hobber
National Broach Checker; Michigan, Gleason

GRINDERS—Miscellaneous

Black Diamond #1 Drill
Brown & Sharpe #5 cyl., 3"x18"
Brown & Sharpe #2, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic, 12"x36, 12x48" Univ.
Covel #91A Univ. Tool & Cutter, Hammond #4 Carbide
Gardner #226, 30" disc, Heald #1 Tool
K.O. Lee Tool & Cutter
Landis #4H Cyl. 4x12", Landis #6 Thread Centerless
Norton #2 Tool & Cutter
Norton Cyl. 6x18" Type C, 6x36" Type C
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6, Granby Int.
Porter Cable Belt WG8, G8

GRINDERS—Surface

Abrasive #1½" Wet Hand Feed, #34 Vertical
Atlantic 6x18" Power Feed
Brown & Sharpe #2, #5 Hyd. 8x24" Cap.
G. & L. #18, 6x18" Hand Feed, #25, #35 Hyd.
Hanchett #300, 13x48"
Mattison 14x16x48 Hyd.
Norton 6x18" Hyd.
Pratt & Whitney 12x36" Vert.
Reid #2A P.F., #2C Pope & Excello Spdl.
Thompson Hyd. 6x10x18", 6x12x18

LATHES

Hardinge Precision 9", cabinet
Hendey G.H. 12x30", 16x39
LeBlond Regal 10"x3½", 15x30", 19x42", 21x60"
LeBlond Heavy Duty 16x33"
Lodge & Shipley 16x28" T.A.
Monarch 10"x20" EE, 16x76" T.A., 12x30" CKK
Rivett Precision, Logan 10"x30"
South Bend 9"x3', 9"x3½', 13x36", 16"x7'
Sebastian 12"x4', G.H., Sheldon 11x24, 1" collet
South Bend 10" Toolroom 1" collet capacity, T.A.

LATHES—Turret

Acme #6W Bar & Chuck, 6W Fox Lathe
Bardons & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, 2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck
Hardinge ESM Second Operation
Jones & Lamson #8A Univ. Saddle Type
Oster #60: Rapiduction, Morey #3, 1½" cap.
Warner & Swasey #3 Universal, #4 Pre-Selector, #4A

MILLS—Plain & Universal

Brown & Sharpe #2 Pl., #2A Univ.
Burke #4 Plain & Univ., Vert. Hds.
Cincinnati #3 Plain, 2MH Univ.
Milwaukee #2HL, 2H, Plain
Milwaukee #2HL, 2H, 3H Univ.
Van Norman #12, 20, 22L, 36

MILLS—Vertical

Bridgeport vertical with Slotting Attach.
Brown & Sharpe #2
Cincinnati #4 Dial Type
Kearney & Trecker #5H
Gorton #8D, 9J Plain
Gorton #8½D Duplicator Fully Equipped
Fosdick Jig Borer #42 Like New
P&W 1½B Jig Borer
Sip Jig Borer #MP-5
Moore Jig Grinder
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production

Brown &Sharpe #000, 12, 2I
Cincinnati #1-12, 2-18 Mfg.
Kent Owens #1V, 2-20
Nichols Hand, Vert. Hd., U.S. MM I
Sundstrand #00, U. S. Duplex

PRESSES

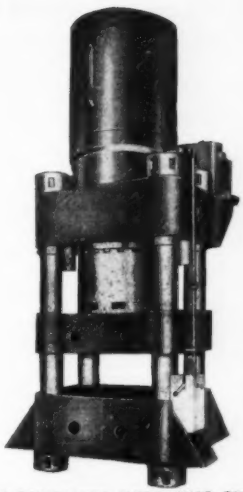
Bliss #8 Dbl. Crank, Bed 42x100", 250 Ton
Bliss #675, 645B, 650 Hi-Production
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #58 O.B. Gap Frame #62, 62A, 162 SS
General Flexible Elec. Screw
Henry & Wright 25, 60, 75 Ton Dieing
Thomas 7A, 80 Ton O.B.I.
Toledo 400 Ton Knuckle Joint #683
V. & O. #25S O.B.I., #102 Reducing
Z & H 30 Ton O.B.I.

MISCELLANEOUS

BAND SAW: DoAll Metalmaster, Tannewitz #36M
BENDING ROLL: Buffalo #0, Excelsior #14
BROACH: 3L LaPointe Horiz. Hydr.
FILER: Oliver, HEAVY DUTY
HACKSAW: Marvel #6A Automatic, #6, #4B
HARDNESS TESTER: Rockwell 4JR, Clark
HAMMER: Niles Bement Pond 2500 lbs. steam
HAMMERS: Rochester Rivetting, Hi Speed
HONER: Micromatic #H-1 Hydrohoner
INJECTION MOLDER: Reed-Prentice #10D6, 6 ounce

NEW IN STOCK

Air Hydraulic Presses—Arbor Presses #6C Famco, ⅓ off list price—Band Saws Kalamazoo 8x18", 8x24"—Drill Presses all sizes—Grinder Surface, Abrasive #1½—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, Famco 4½, 7½ Ton, Rousselle O.B.I. & Horn 5, 10, 15, 25 Ton, Pressrite OBI, 5, 10, 12, 18, 30 ton cap.—Shaper, 7" Ammco, 8" Shaprite, Sheldon 12"—Shears Foot 22" to 8', 16 & 18 ga., Shears, Power, 3'x18 gauge to 10 x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Aztech, Haloo, HS 5 & 10 Speed—Motors, Grinders, Buffers, all sizes.



SELF-CONTAINED HYDRAULIC PRESS

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen	Stroke	Opening
500 Ton	Lake Erie	35x36"	36"	66"
600	Bald. S'thw'k	76x59"	22"	36"
500 D.A.	H.P.M. (160 Cushion)	36x36"	24"	36"
1000	French Oil	83x42"	28"	50"
300	Brand New Watson Stillman Hobbing Press			
375 D.A.	Elmes (60 Cushion)	84x44"	12"	42"
350	Verson	40x40	36"	72"
50	Dennison	22x28	18	23
150	Southwark	34x30	30 2" to 4"	

UP MOVING RAM PRESSES

50 & 100 Ton Stokes Molding Presses & Pumps
300 Ton Dunning & Boschert Molding Press
500, 800 Ton Waterbury-Farrel 3 & 4 Rod Presses, 6 & 6½" strokes
300 Ton Watson Stillman Press, 24x20" Platens
400 & 500 Ton Shaft Straighteners—Self Contained

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

IRONWORKER: Buffalo 25U x 20 Univ.
KEYSEATER: Mitts & Merrill, Baker Davis
PRESS BRAKE: #253, #335 Chicago
ROUTER: Onsrud #W240, #55 Oliver
SHAPER: 8" Shaprite, Ammco, Atlas
SHEAR: Pexto, 6'x14 Ga. Power
SHEAR THROATLESS: #138 Lenox
SPEED LATHES: Cincinnati, Schauer
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
THREADERS: Oster Pipe & Bolt
WELDERS: Seam; Thompson
WELDERS SPOT: Taylor-Winfield 50 KVA, Selsky
WRAPPING ROLL: Buffalo #½

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LATEST TYPE
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MACHINE TOOLS

BORING MILLS—Horizontal

CINCINNATI GILBERT 3½" bar, floor type, latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #32T, 2¾" Bar—latest
GIDDINGS & LEWIS #45, 5" Bar, Table Type, latest
LUCAS #61, 3" bar, Table Type, Latest Type
NILES BEMENT POND 5", 6", 8", bar, fl. type, M.D.
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, Motor Drive
BULLARD 16", 6 spindle Multaumatic, Latest Type
BULLARD 34", 36", 54", "Spiral Drive"—Latest
BULLARD 61" "Mult-Miller," 2 heads, Motor Drive
KING 62", 2 swivel heads, PRT, M.D.
NILES 100", 2 swivel heads, PRT, DC, M.D.

DRILLS

AMERICAN 3' arm 9" column, "Hole Wizard," latest
AMERICAN 4' arm 11" column, "Hole Wizard", latest
LELAND & GIFFORD #1LM8, 4 spindle, latest
LELAND & GIFFORD #2LM8, 6 spindle, latest

GEAR CUTTING EQUIPMENT

FELLOWS #61, #7, #7A, #72, #75, #77 High Speed Gear Shapers, latest type
FELLOWS #2, #22, Gear Shaper, latest
GLEASON 5", 12" straight bevel generator, Latest
GOULD & EBERHARDT #12H, 12HS, Hobber, Latest
GOULD & EBERHARDT #9H, Hobber, with diff., MD

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
LANDIS 4x12, 4x18, Type B Plain Hyd., Latest
NORTON 6x18", 10x12", 14x36", Type C, Plain, latest
NORTON 6"x20", 10"x36" type C Plain Hydr., Latest

GRINDERS—Miscellaneous

BRYANT #16-CP-16, #24 Int. Hyd., latest
CINCINNATI #2 Centerless "Filmatic," latest
CINCINNATI Centerless Lapper, Model ED, Latest
COVEL #22 Universal Tool & Cutter, Latest Type
HEALD #72A3, 72A5 "Gagematic," Internal, Latest
HEALD 75A, 72A3, 72A5, 74, 70A Internal, latest
LANDIS #12 Centerless, latest type

GRINDERS—Surface

HANCHETT Series 300, 12x18" Vert. spdl. hyd., latest
HEALD #22 Rotary, 12" chuck, latest type
HEALD 25A—rotary—16" and 20" chuck, hyd. latest
THOMPSON 12x12x24 Model B Hyd., Latest Type

LATHES—Engine & Mfg.

AMERICAN 36"x360" centers, 2 carriages, motor dr.
LEHMANN 16x30" centers, TIMKEN, latest type
LOSWING 4x60, 4x24, 8x60, 8x160, 5x24, Latest
MONARCH 12"x54" centers, Timken, Latest Type
MONARCH 16"x20" centers, Model EE, Timken, latest
MONARCH 16"x14" centers, Timken, Latest type
MONARCH 22"x456" centers, 3 carriage, Timken Bearing, motor drive
NILES 30x50' Boring, Timken, Latest Type 16"x30"
PRATT & WHITNEY 14"x54" Centers, 16"x30" Type C, Timken, Latest
SPRINGFIELD 16"x30" centers, Timken, Latest Type
WARD, HAGGAS & SMITH—18/30x86" centers gap.

LATHES—Turret

BARDONS & OLIVER #5, #7, Timken, Latest Type
FOSTER #4PU "Fastermatic" Timken, Latest
GISHOLT #1L, #2L, #3L Universal, Timken, Latest
GISHOLT #3, #4 Univ., TIMKEN, Latest Type
JONES & LAMSON #3, #5 Univ., Timken, Latest
LIBBEY "International" 1-H5, Univ., Timken, latest
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON #5D, #7DDE, Timken, latest
WARNER & SWASEY #1, 2, 3, Ram—Timken, latest
WARNER & SWASEY #2A Universal, Timken, Bar & Chucking, Latest Type (Preselector)
WARNER & SWASEY No. 4A, 8" bar, serial over 1,000,000, Latest Type

MILLING MACHINES—Plain

BROWN & SHARPE #2, Light Type, Timken, latest
BROWN & SHARPE #3, #5, Timken, Latest Type
CINCINNATI 6-8 Auto., Rise & Fall, Latest Type
CINCINNATI #4 TIMKEN, Motor Drive
CINCINNATI 4-36, 2-18 Hydromatic, Simplex, latest
KEARNEY & TRECKER 2H, 3H, 4H, Timken, latest
KEARNEY & TRECKER #3, 4, Hyd., Timken, M.D.
KEMPSMITH #3G, Timken, latest type
KEMPSMITH #5 Maximiller, Timken, latest type

MILLING MACHINES—Vertical

BROWN & SHARPE #2, Timken, latest type
CINCINNATI #2 Dial Type, Timken, latest type
GORTON #4½D 97 high speed, latest
REED PRENTICE 3VO, with dumbinator, Latest

SCREW MACHINES—Automatic

BROWN & SHARPE #2G High Speed, Latest Type
CLEVELAND 9/16" model A, high speed, latest type
CONOMATIC 6", 4 spindle, Latest Type
CONOMATIC 2⅝"—4 spindle, Latest Type
GOSS & DeLEEUW 8" auto. Chucker, 5 spin., latest

MISCELLANEOUS

AJAX 2", 35½" Forging and Upsetting, M.D.
AMERICAN V-2, 6 ton 36" stroke Vert. Broach—Latest
BARNES #179, 30SH, 90T Vertical Hone, Hydraulic, Self-Oiling, Latest Type
CINCINNATI 1-30, 2-30 Duplex Vert. Surface Broach, Double ram, Model 3B, Hyd. Latest Type
FOSDICK Model 42 Jig Borer, latest type
LACK RIVE 500 ton Vertical Hydraulic Press, latest
MICHIGAN #1708A Cutter Reliever, Leaf Type
NILES "Time Saver" 48"x48"x12" Planer—3 heads, Box Table, P.R.T., Latest Type
PRATT & WHITNEY 6' x 6" Thread Miller, latest
PRATT & WHITNEY KELLER, Type ML-7414 & Type G Copying, latest type, 2 & 3 Dimensional
QUICKWORK ¾" x 1" cap Rotary Shear—M.D.

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MILLERS

Cinn. #3 Dial Type—Plain—High speed, vertical hd., power rotary table, dividing heads and tooling.
Brown & Sharpe #2 Light Type, Plain & Univ.—attachements.
Cinn. #3B Rest. Overarm, motor-in-base, Univ.
Van Norman 36BU Ram Type Univ. (late).
Pratt & Whitney 1½B Jig Borer.

LATHES

Bridgeford 36"x56' Br. Hd. M.D., 48' C. Dist.
Niles-Bement-Pond 48"x24' Gr. Hd., D.C. M.D., 15' C. Dist.

Reed-Prentice 16"x8' Model B 54" C.D., 1942.
4—Reed-Prentice 16"x8' Model AA 54" C.D., 1935.

Sundstrand #8—15" and #10—22" Automatic Stub (late).

TURRET LATHES

Jones & Lamson #5 Ram Type, bar equip., 3" hole.
Bardons & Oliver #3 Univ., bar equip., 1⅞" hole.
Gisholt #5 Univ. Pro-sotes. Hd., chucking.

DRILLS

American 3'9" "Hole Wizard" Radial Drill, box table.
Morris 4'9" Mor-Speed, Radial, box table, (late).

Footebort #3, 12" 6-spindle Power Feed—Sipp Type—Sensitive Drilling Machine (Equal to new).

Avey #3—12", 2 spindle, MA-6, Power Feed, motor spindles (late).
Leland-Gifford #3—2 and 4-spindle, Power Feed, Bk. Gr., M.D.

GRINDERS

Brown & Sharpe #13 Univ. & Tool, attachments (late).

Gallmeyer & Livingston #5—12"x36", Hydraulic Surface.
3—Norton 6"x18" Hydraulic Horizontal Surface.

Blanchard #16-A Rotary Surface—30" chuck.
Cinn. #2 Centerless Filmatic Bearing—long bar attch., auto. infeed attch.
Blanchard #11 Rotary Surface—16" chuck (late).

PRESSES

Reliance #45 O.B.I. Hydraulically operated clutch, high speed (late).
Toledo #59—250-ton, 18" stroke, S. Sided, Dbl. Gr., 4-po. Tie Rod Constr., M.D.

SHAPERS

Hendey 12" Univ. Timken Bearing (late).
Gould & Eberhardt 24" Dbl. Train Gear Drive, "Invincible".
Hendey 32" M.D. Crank, Timken Bearing.

PLANERS

Woodward-Powell 48"x48"x14' Dbl. Housing, 4 heads, Rev. M.D.
Cincinnati 78"x56"x22' Dbl. Housing, 4 heads, M.D.
Woodward-Powell 36"x36"x10' Dbl. Housing, 3 heads, M.D.

HAMMERS & FORGING MACHINES

Chambersburg 2500# and 4000# Board Drop.
Standard 1200# Board Drop—1943.
National 3", 5", & 7½" Upset Forging Machines.

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PEXTO Model G-3120 Gap Shear 10'-10-ga.

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BLAKESLEE Degreaser Type D-85-P

REX Spot Welder 40 KVA

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AUTOMATICS

No. 18 New Britain 6 spdl. chucking
No. 454 New Britain chucking
14"x19" Fay Chucking
8" Bullard 6 spindle Mult-Au-Matic
½", No. 0G Brown & Sharpe
⅝" Acme Gridley Model R6
⅞" & 1¼" Cone 4 spindle
1" Economy shaver, hopper feed
1⅛" Cleveland 4 spindle
1⅝" New Britain, Model 61
1⅞" Conomatic 8 spindle
2"x18" Cleveland Model B
2⅜" Acme Gridley Model RA6

BORING MILLS

100" Niles Bement Pond vertical
52" King vertical
24", 30" & 42" Bullard vertical
21½" bar, No. 25 Giddings & Lewis
3" bar, No. 3A Universal
3" bar, No. 31 Lucas
3¾" bar, No. 5A Defiance
3¾" bar, No. 32 Lucas
5" bar Jones, planer table type
Nos. 112B & 2112 Excello precision
Nos. 42, 47A & 48A Heald Boremastic

GRINDERS

Nos. 1 & 2 Brown & Sharpe univ.
10"x24" Landis hydr. universal
No. 2 Norton univ. tool & cutter
26", No. 226 Gardner disc
53", No. 372 Besly horiz. disc
No. 115 Gardner opposed disc
No. 230 Hanchett opposed disc
No. 2 Cincinnati centerless
No. 510 Oliver drill grinder
Nos. 6G & 10G Sellers drill grinders
Norton, 6"x18", 10"x36" & 23"x36"
Landis 6"x18", 14"x36"
No. 2B Brown & Sharpe surface
12"x48" Thompson surface
14"x60" Mattison surface
No. 34 Abrasive surface
18" & 24", No. 25A Heald surface
12" & 18", No. 22 Heald surface
Nos. 72A3, 72A5, 74 Heald internal
No. 72A3 Heald Sizematic
No. 72A3 Heald Sizematic centerless
Nos. 16A16, 16-28, 16-38 & 24-36 Bryant

LATHES

36"x16' Bridgeford
25"x48" centers Leblond
20"x8' Lodge & Shipley
18"x8' Rockford
16"x8' Porter McLeod
16"x30" centers Monarch
16"x5' Sebastian
14"x6' Lodge & Shipley

LATHES, TURRET

Nos. 2, 3, 4, 5, 1A & 3A Warner & Swasey
Nos. 5 & 7 Bardons & Oliver
Nos. 3, 4 & 3AL Gisholt
24" & 42" Bullard vertical
No. 62 Denver
No. 4 Midland
Nos. 2G & 3 Morey
3"x36" & 4"x34" Jones & Lamson

SHAPERS & PLANERS

6" Pratt & Whitney vert. shaper
16" Bement Miles slotter
16", 20", 24" & 28" G&E shapers
20" & 24" Gemco univ. shapers
24" Columbia univ. shaper
30"x24"x6' Liberty openside planer

SHEET METAL TOOLS

8'x¼" Cincinnati press brake
8' x 10 ga. Dreis & Krump leaf brake
10' x 14 ga. Dreis & Krump leaf brake
8' x 10 ga. Beloit bending roll
No. 202½ V. & O. thread roller
72" x 14 ga. Wysong & Miles shear
60", 14 ga. Pettingell rotary shear
Nos. P1, P2, P3, P4, P5 Ferracute presses
Nos. 18 & 19 Bliss OBI presses
No. 6 American Can OBI press

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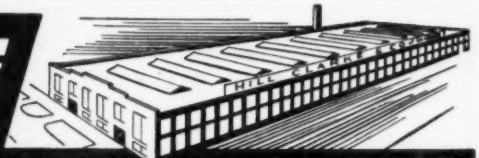
HILL-CLARKE MACHINERY COMPANY



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AUTOMATICS

No. 2 Brown & Sharpe
1⅝" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpe
No. 48 New Britain, 4 Spdl. chucker
Model A 2½" Cleveland
Model A 3¾" Cleveland (1942)

DRILLS

No. 150 Baker
No. D8 Colburn No. 6 Morse Taper
No. 1LMS—20"—5 Spdls. Leland-Gifford
No. 2LMS—28"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—28"—4 Spdl. Leland-Gifford
No. 2LMS—28"—6 Spdl. Leland-Gifford
No. 4BL Natco 36 Spdls.
6'-17" Col. Fosdick Radial
7'-15" Col. American Full Universal

GEAR MACHINES

No. 61 Fellows Gear Shaper (1942)
No. 61-A Fellows Gear Shaper
No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 16 HS Gould & Eberhardt
No. 10H Gould & Eberhardt
No. 6 Gleason Gear Tester
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HORIZONTAL BORING MILLS

No. 31 Lucas, 3" bar
No. 46-B Heald Bore-Matic
No. 112—C Excello 2 Spdl.

GRINDERS

3"x12" Brown & Sharpe No. 5 (1944)
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders ranging from 6"x18" to 24"x240"
No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 36-A Hanchett Rotary Surface
72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Grinder (1942)
No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Gdr. (1942)
No. 16-36 Bryant Internal Grinder (1942)
No. 24-26 Bryant Internal Grinder (1941)

LATHES

15"x5' Sebastian, Geared Head
16"x54" centers LeBlond (1941)
16"x80" centers Pratt & Whitney, Model B
18"x6' American, Grd. Head
19"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
36"—48"x16' Lehman hydratrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x16" Sundstrand, Model D (1942)
10"x22" Sundstrand, Model AA (1943)
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)
R—14 Seneca Falls Lo-Swing

MILLING MACHINES

No. 4 Cincinnati Plan (1943)
No. 2 H Milwaukee Vertical (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cinn. Mfg. (1940)
No 2—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex
No. 45-48 Cinn. Hyd. Duplex
No. 46-72 Cincinnati Hydromatic (1942)
No. 56-72 Cincinnati Hydromatic
4½"x12" Pratt & Whitney, Model C
4"x9" Hanson-Whitney Univ. Thrd. Miller
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
8"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Traveling Column Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
8-M Wells Band Saw
Model H-100 Micromatic Hydro Honer
Model 200—H5 Micromatic Horiz. Hone
No. 2 V & O open back press
Baush Radial Tapper (1942)

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4B Libby, Bar Feed (1942)
No. H-5 Libby
No. 5 Bardons & Oliver (1942)
No. 5 Midland, Bar Feed (1942)
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼" Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERTICAL BORING MILLS

42" Bullard New Era
42" Colburn
60" Colburn
72" Niles Extra Heavy
84" Betts

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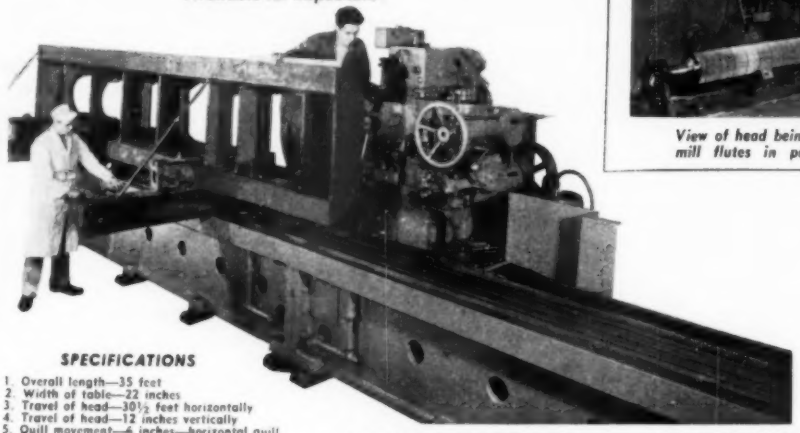

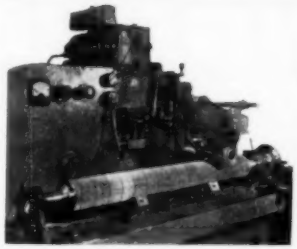

View of head being used to mill flutes in paper roll.

SPECIFICATIONS

1. Overall length—35 feet
2. Width of table—22 inches
3. Travel of head—30½ feet horizontally
4. Travel of head—12 inches vertically
5. Quill movement—6 inches—horizontal quill
6. Spindle speeds—350 to 1217 RPM—rheostat adjustment
7. Head travel 5" to 40" per min.—200" per min. rapid traverse
8. Power—250 Volt D.C. Spindle motor is 15 HP. Feed Motor is 5 HP. Machine is equipped complete with all electric motors, contractors and controls.
9. Machine is equipped with a hydraulic cam follower device for contour milling.
10. Machine is equipped with leveling jacks.
11. Weight—52,000# (approx.)

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Cincinnati 1-18 Prod. Mill Backlash Elim. '43
Sundstrand #1 Horizontal Rigidmill '42
B. & O. #5 Bar Feed '45
Gisholt #3 Bar Feed Pre-Selector Head '43
New Britain Model 61 1⅝" 6 Spindle Auto. Screw Machine '42
B. & S. No. 2-G Auto. Screw Mac. '42
Pratt & Whitney 12"x30" Tool Room Lathe TA '44
Springfield 14"x24" Mfg. Lathe '40
Cincinnati #2 Tool & Cutter Grinder, '41
Blanchard #11 Rot. Surface Grinder '43
Norton 10"x36" Semi-Auto. Cyl. Grinder '44
Norton 14"x72" Plain Cyl. Grinder, Rebuilt
Cincinnati #2 Centerless Grinder, 41
Jones & Lamson Model TG-615 Thread Grinder, '42
Allen 2KH 6 Spindle Drill Press '45
Avey Model MA-8—2 Spindle Bench Drill '43
Foot-Burt 2 Spindle Drill Press '45
Canedy-Otto 3 & 4 Spindle Drill Presses
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Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp. Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20'x8' Grd. Hd., M.D.
& 28"x12' Lathes Monarch Model "C"
American 24x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinnati No. 2 Centerless Grinder
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl, Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd. hd. Turret Lathe, M.D.

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#6 B & S Automatics, cap. 2"x5"
6"x20" P & W Thread Miller, 1945
#1½ Cinn. Acme Turret Lathe, Chucking 1943
Simmons Turret Lathes, 1⅝" cap., late
60" Bullard Boring Mill, old machine

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used and rebuilt
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AUTOMATICS

6" RPA-8 Acme Gridley Chucker. 1941.
16" Bullard Mult-Au-Matic, 6 spdl. 1942.
6" Goss & DeLeeuw Chucker, 8 spdl. 1943.
1⅝" Greenlee, 6 spindle. 1942.
No. 1½ B-18 Cleveland. 1940.
No. 60 New Britain, 6 spdl. 1" cap. 1942.
9/16" RA-6 National Acme. 1942.
9/16" RA-6 Acme Gridley Chucker. 1942.
Model 3-8 Ceco, ⅜" cap. Late.

BORING MACHINES

No. 42 Lucas Horiz. 4" bar. 1940.
No. 54 Excello Way Type Double End. 1940.
No. 2112A Excello Single End. 1943.
No. 49 Heald "Bore-Matic" Double End. 1942.
No. 49 Heald "Bore-Matic" Single End. 1942.
No. 47A Heald "Bore-Matic" Single End. 1942.

BROACHES

No. V-2 American Vertical. 1943.
No. CPC 6-30 Lapointe Vertical. 1941.
Model XA Oilgear Horizontal, 48" stroke.

DRILLS, HEAVY DUTY

W6 Baush Hyd. Multiple Spindle. 1943.
25" Fosdick Economax. 1941.
No. 121 Baker Upright. Late.
21" Canedy Otte. Like New.
No. 40 Fox Multiple Spindle. 1944.
No. 3 Bauch Multiple Spindle.
Barnes 2 Spindle Deep Hole. 1943.
No. ½Bx50 P&W Deep Hole Drill. Late.
No. ½Bx50 P&W Deep Hole Reamer. Late
No. ½Bx30 P&W Deep Hole Reamer. Late.
No. ½Bx50 P&W Deep Hole Rifler. Late.

DRILLS, RADIAL

Bauch Comb. Drill & Tapper. Late.
3' Leland Gifford Tapper. 1941.
20" Pfiffner Drillmaster. 1942.

DRILLS, SENSITIVE

No. KH2 Allen, 6 Spindle. 1943.
16" Atlas, 4 Spindle. 1942.
15" Atlas, 4 Spindle. 1942.
14" Delta, 4 Spindle. 1942.
No. 2 MS Allen, 1 to 3 Spindle. 1942.
No. 2 Hamilton-Muehlmat. 1943.

GEAR EQUIPMENT

No. 12 Gleason Gear Rougher. 1943.
No. 17 Gleason Gear Tester. 1943.
3" Gleason Bevel Gear Gen. 1942.
No. 6 Gleason Tester. 1942.
No. 7 Gleason Revex Cutter Sharpener. 1942.
No. 12 Gleason Tool Sharpener. 1942.
No. 140 Cleveland Rigidhobber. 1942.
Vinco Spline & Gear Grinder. 1942.
No. 7125A Fellows Gear Shaper. 1943.
No. 715 Fellows Gear Shaper. Late.
No. 712 Fellows Gear Shaper. 1942.
Type S Barber Colman Hobber. 1942.
No. 860B Michigan Finisher. Late.
12" Red Ring Internal Shaver. Late.
No. GCL-3 Red Ring Shaver. 1942.
15" Red Ring Lapper. 1942.
10" Red Ring Gear Speeder. Late.
Red Ring Universal Gear Checker. 1942.

GRINDERS, CYLINDRICAL

16"x36" Cincinnati Plain. 1942.
14"x36" Norton Type C Universal. 1943.
12"x48" Cincinnati Universal. 1943.
10"x72" Landis Type C Plain. 1942.
10"x72" Norton Type C Plain. Late.
10"x24" Landis Type C Universal. 1942
10"x18" Norton Type C Plain. 1942.
6"x30" Cincinnati Plain. 1943.
6"x24" Norton Plain. 1936.
6"x18" Cincinnati Plain. 1942.
6"x18" Landis Type C Plain. 1941.
6"x18" Norton Type C Plain. 1942.
4"x12" Landis Type H Plain. 1944.
No. 5 Brown & Sharpe Plain. Late.
No. 2 & 3 Cincinnati Centerless. 1942.
16"x72" Norton Crankshaft Grinder.

GRINDERS, INTERNAL

No. 16A22 Bryant Hydraulic. 1943.
No. 81 Heald "Sizematic". 1942.
No. 74 Heald Extended Bridge. 1941.
No. 75A Heald Two Motor. 1943.
No. 72 A3 & A5 Heald Plain. 1944.
No. 50 Heald Plain. 1941.
No. 5 Bryant Internal. Late.
No. 104 Rivett Internal-External. 1943.

GRINDERS, SURFACE

14"x36" Pratt & Whitney Vert. 1938.
6"x18" Robot. 1942.
No. 2B Reid. 1944.
No. 2-3 Reid. Late.
No. 25A Heald Rotary. 1942.
No. 22 Heald Rotary. 1943.
A1-8 Arter Rotary. 1942.
6" Taft Pierce Rotary. Late.

GRINDERS, TOOL & CUTTER

72" Lapointe Broach Grinder. 1941.
72" Thompson Broach Grinder. 1941.
72" Rogers Knife Grinder. Late.
No. 22 Covel Universal. 1942.
No. 91A Covel Universal. 1942.
No. 4T Sellers Carbide. 1942.
Barber Colman Comb. HRS. 1943.
Sundstrand Carbide. 1942.
No. 2 Leblond. Late.
No. 6-G Sellers Drill Grinder. 1942.
No. 13 Brown & Sharpe Universal.
No. 44 & 48 Excello Carbide. 1942.
Milwaukee Face Mill. 1942.
No. P5 Bura-Way Carbide. 1942.

LATHES, ENGINE

24"x168" Sidney. 1942.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.
14"x78" Reed Prentice. 1942.
14"x54" Reed Prentice. 1942.
14"x30" Bradford. 1942.
14"x30" Lodge & Shipley. 1943.
14"x6' Hendey.
12"x36" Sebastian. Late.

LATHES PRODUCTION

20"x25" Fay Automatic. 1942.
14"x42" Monarch "Magna-Matic". 1941.
12"x18" Lipe "Carbo". Latest.
10"x21" Sundstrand, Model 10. 1942.
9"x20" Lipe High Speed. 1942.
8"x36" Lo-Swing Semi-Auto. 1942.
8"x21" Fay Automatic. 1942.
8"x15" Sundstrand, Model 8. 1942.
Model IMP & R Lo-Swing 1942.

LATHES, TURRET

No. 3A Warner & Swasey. 1943.
No. 9A Jones & Lamson. 1942.
No. 3L Gisholt. 1941.
No. 2FU Foster "Fastermatic". 1943.
No. 1 Acme Universal. 1941.
No. 8½"x24" Acme Universal. 1943.
No. 2, 3, 4 & 5 Warner & Swasey. 1942.
No. 2, 3 & 7 Bardons & Oliver. 1943.
No. 3 & 4 Gisholt. 1943.
No. 2L Gisholt.
No. 2A Warner & Swasey.

MILLING MACHINES, PLAIN

No. 4K Milwaukee. Late.
No. 3B Brown & Sharpe. 1941.
No. 3 Van Norman. 1942.
No. 2H Milwaukee. Late.
No. 2HL Milwaukee. 1942.
No. 2L Van Norman. 1942.
No. 2B Brown & Sharpe.
No. 3 Cincinnati.
Nichols Hand Mill. 1942.
No. 1M Kent Owens Hand. 1942.

MILLING MACHINES, PRODUCTION

No. BL-2420 P & W "Keller", 3 Spindle. 1942.
No. BL-2416 P & W "Keller", 1 Spindle. 1943.
No. BG-1 "Keller", Single Spindle.
No. 1248 Milwaukee "Simplex". 1942.
No. 4-48 Cincinnati Hydromatic. 1943.
No. 4-36 Cincinnati Hydromatic. 1942.
No. 2-18 Cincinnati, Rise & Fall. 1942.
No. 1-18 Cincinnati Plain. 1942.
No. 12 Brown & Sharpe. 1942.
No. 2-20 Kent Owens. 1942.
No. 1-14 Kent Owens. 1943.
No. 08 Cincinnati, Rise & Fall. 1942.
No. 08 Cincinnati, Plain. 1942.
No. MM-1-5-2 U.S. Multi-Miller. 1943.
No. MM-1-6 U.S. Multi-Miller. 1942.
No. 0, 00 & 2 Sundstrand "Rigidmil". 1943.

MILLING MACHINES, THREAD

6"x60" Pratt & Whitney. Late.
12"x54" Lees-Bradner. 1943.
8"x16" Hanson Whitney. Late.
4½"x12" Pratt & Whitney. 1942.
4"x9" Hanson Whitney. Late.

MILLING MACHINES, UNIVERSAL

No. 2 MH Cincinnati. 1942.
No. 2L Cincinnati. 1941.
No. 2H Milwaukee. 1942.
No. 2SU Van Norman. 1942.

MILLING MACHINES, VERTICAL

No. 3K Milwaukee. 1942.
No. 3H Milwaukee. 1940.
No. 3 Cincinnati. 1942.
No. 2K Milwaukee. 1942.
No. 2 Cincinnati. 1940.
No. 2 Milwaukee.

MISCELLANEOUS

No. 35 Excello Univ. Thread Grinder. 1943.
6'x½" Bertsch Bending Roll. Late.
6'x14 Ga. Pexto Power Shear. 1941.
10'x14 Ga. Chicago Press Brake. Late.
No. 405 Williams Turnings Crusher. 1943.
200 Lb. Bradley Helve Hammer. 1941.
No. 7B High Speed Riveting Hammer. 1942.
PC-14 Jones & Lamson Comparator. Late.
50 KVA Federal Spot Welder. 1942.
No. 616 Cleveland Rigidturner. Late.
No. 26F Norton "Hyprolap". 1942.
No. 1 Savage Roller Type Nibbler. New.
No. 3U Gorton Pantograph. Like New.

PLANERS & SHAPERS

52"x36"x40' Cincinnati Planer.
36"x36"x16' Ohio Planer.
24" American Crank Shaper.
20" Gould & Eberhardt Shaper.
16" Gould & Eberhardt Shaper.
12" New Haven Vertical Slotter.
6" Pratt & Whitney Vertical Shaper.

PRESSES

100 Ton Hannifin Hydraulic. 1942.
50 Ton Denison Hydraulic. Late.
45 Ton Reliance. 1942.
No. 8-6 Zeh & Hahnemann. 1942.

SAWS

14"x20" Racine "Shear-Cut". 1942.
13"x13" Peerless Universal. 1943.
No. 302 Campbell Abrasive. Late.

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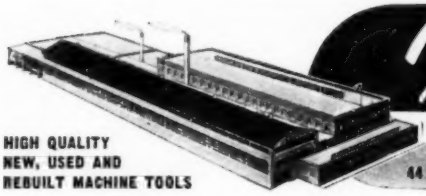

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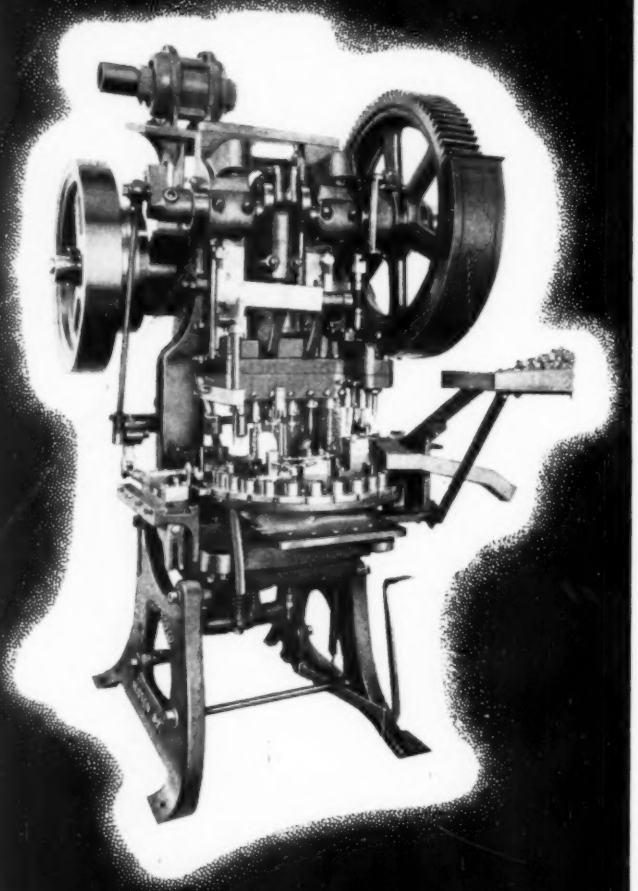

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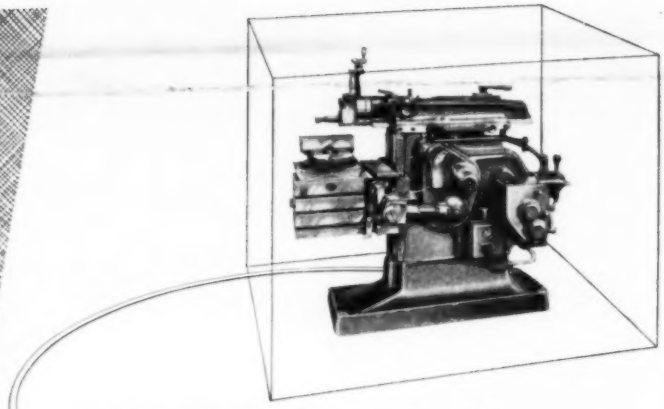

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The Hendey 12" Crank Shaper is finished like a fine watch, both inside and out. Here is an accurate, fast money-maker for tool room and production work. Write today for complete details.

BRIEF SPECIFICATIONS

Length of Stroke	12¾"
Strokes per minute	14 to 200
Speed changes	8
Vertical travel of tool slide	4⅝"
Table top tilts either way	15°
Max. distance vise to ram	8 13/16"
Max. rotation of table	360°
Max. vise opening	10½"
Net weight	2825 lbs.
Floor space	46" x 68"

Other Hendey Machines Include
Tool Room Lathes — 9"- 12"- 14"- 16"- 18"- 20"- 24"
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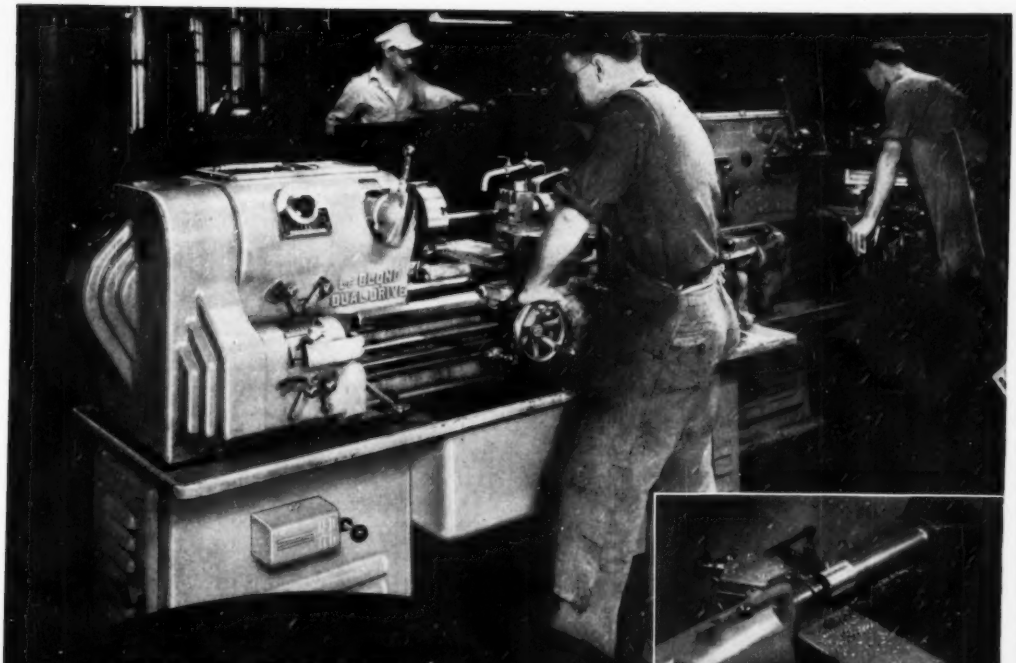

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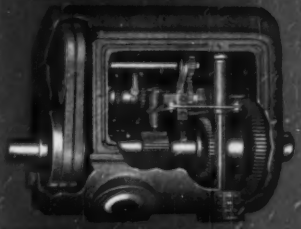

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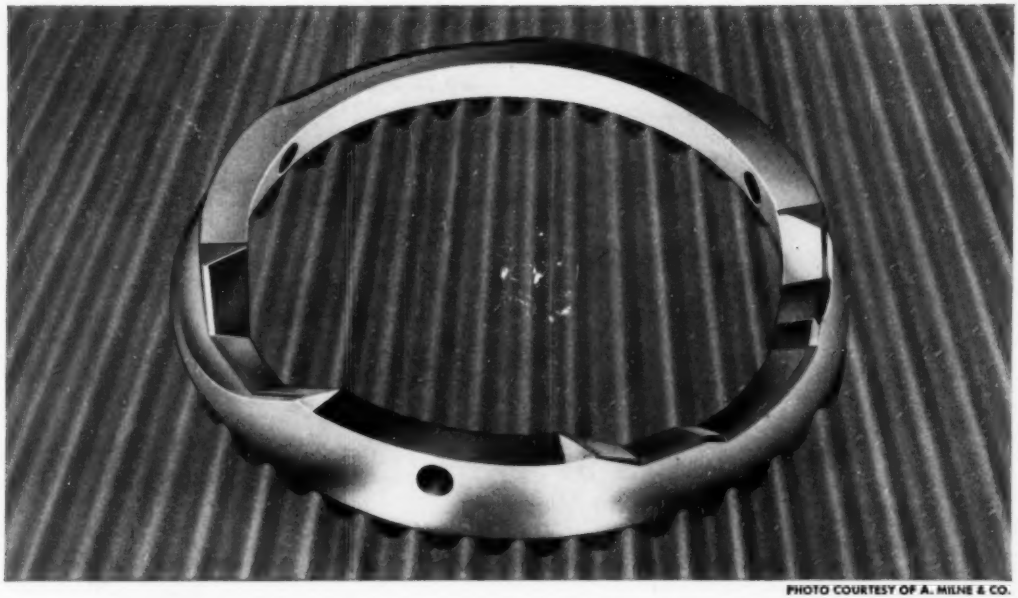

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